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UNITED STATES DEPARTMENT OF THE INTERIOR

FISH AND WILDLIFE SERVICE

Arnie J. Suomela, Commissioner

MARCH 3, 1849

THREE FORKS DIVISION

MONTANA

FISH AND WILDLIFE RESOURCES

Frontispiece. In addition to the fine catches of trout that can be made in stretches of water like this in the Madison Canyon, the beautiful setting contributes to making the Madison world renowned. (Photo by L. E. Hiner)

DEPARTMENT OF THE INTERIOR
U. S. FISH AND WILDLIFE SERVICE
Bureau of Sport Fisheries and Wildlife
1001 N. E. Lloyd Blvd.
P. O. Box 3737
Portland 8, Oregon

October 23, 1958

Memorandum

To: Regional Director, Bureau of Reclamation, Region 6,
P. O. Box 2553, Billings, Montana

From: Regional Director

Subject: Three Forks Division, Montana

This is a synopsis of my report on the relation of fish and wildlife resources to the water-development plans for the Three Forks Division, Montana. More detailed material is contained in the attached substantiating report. The report was prepared under authority of the Fish and Wildlife Coordination Act approved August 12, 1958 (72 Stat. 563).

The Montana Fish and Game Commission expressed its views on the proposals for the Three Forks Division in a statement dated October 14, 1958. The salient points of this statement are included in this synopsis; the statement is set forth in its entirety in the attached substantiating report.

FISH AND WILDLIFE AND THE THREE FORKS DIVISION

Fish and Wildlife Resources

The Three Forks Division, which encompasses the Jefferson, Madison, Gallatin, and Missouri River drainages above Canyon Ferry Reservoir in southwestern Montana, covers 15,610 square miles. This area is outstanding in the varieties and numbers of fish and wildlife and is known nationwide for the opportunities it offers for hunting and fishing.

The streams, ranging in size from the 100-yard wide Missouri to small headwater brooks, and the high mountain lakes offer nearly every variety of fishing. Still fishing, spinning, or fly casting for brown,

rainbow, brook, cutthroat, and golden trout, mountain whitefish, and grayling are available. The fish resources of the area are used extensively by Montanans and nonresidents alike. The vast majority of the fishermen fish the major rivers; only a small percentage fish the small streams and high mountain lakes.

The five best fishing streams in the Three Forks area, the streams which would be most affected by water-development plans to be described later, are the Madison, Gallatin, Beaverhead, Big Hole, and Jefferson Rivers. These streams provide fishing for thousands of fishermen annually and commonly produce trout weighing 3, 4, and 5 pounds.

Of the five rivers, the Madison is the best known. In fact, the Madison is one of the better known trout streams of the West. Its fame rivals that of the nationally known Rogue in Oregon, the Gunnison in Colorado, and the Beaverkill in New York. Although not so well known nationally as the larger Madison River, the Gallatin also provides excellent trout fishing.

The Beaverhead River offers excellent fishing throughout most of its length. The Big Hole River also is well known for its excellent trout fishing and is particularly famous for the "lunkers" it produces.

The Jefferson River is becoming more important to Montana fishermen each year, and indications are that in future years it will receive increasing attention from nonresident anglers. The rate of catch may not be so high as in other streams but large trout frequently are taken. Whitefish are particularly important in this stream as they are in the Big Hole and Beaverhead Rivers.

The Three Forks Division covers an area of high value so far as wildlife is concerned. Its mountain ranges afford excellent habitat for elk, moose, bighorns, and mountain goats. Mule deer are common to all of the land not intensively cultivated. Antelope inhabit many of the lower valley lands. Fur animals of nearly every variety occupy preferred habitat throughout the region. Of the native grouse, the blue and ruffed which live in the mountains are hunted to a lesser extent than are the sage grouse and sharp-tailed grouse which inhabit the foothills and prairies. Pheasants, Hungarian partridges, and chukar partridges occur in suitable habitats, mainly in the valley lands along the larger rivers. The area contains excellent waterfowl habitat. Canada geese and trumpeter swans as well as several species of ducks are common breeders there. The Red Rocks National Migratory Waterfowl Refuge, established in 1935 to preserve the then-vanishing trumpeter swan, is located in the extreme southern tip of the Three Forks Division.

Because of its populations of big game, hunters are attracted to the Three Forks area from all over the State of Montana. The Gallatin

elk herd, which summers in Yellowstone National Park and winters along the upper Gallatin River outside the Park, it well known outside of the State and attracts many nonresident big-game hunters. The excellent waterfowl hunting in the area annually attracts hundreds of hunters from other parts of Montana. Upland-game hunting is largely confined to that by local residents.

Water-Resource Development

The water-resource development plan for the Three Forks Division is for the purposes of irrigation, flood control, power development, fish and wildlife, and recreation. The plan includes Reichle Reservoir on the Big Hole River; Clark Canyon Reservoir on the Beaverhead River; Apex Reservoir on Birch Creek; and Milligan Reservoir, an off-stream facility adjacent to the Jefferson River.

In addition to a power diversion on the Madison River, the plan provides for irrigation diversions on the Madison, Jefferson, Big Hole, and Beaverhead Rivers and Birch Creek. Also included in the plan is ground-water pumping in the Gallatin Valley and a pumping plant on the Missouri River.

The development provides for a full water supply to 93,520 acres and a supplemental water supply to 129,675 acres in eight different units. Five of the units are in the Jefferson sub-basin. These are the East Bench, West Bench, Whitehall, Jefferson, and Clarkston Units. The Lyon (power unit), Madison, and Cameron Bench Units are in the Madison sub-basin, and the Gallatin Unit is in the Gallatin sub-basin.

Effects of Water Development on Fish and Wildlife Resources

Construction and operation of Clark Canyon and Reichle Reservoirs would result in the loss of stream fishing of considerable more value than the reservoir fishing which would replace it. Construction and operation of Milligan and Apex Reservoirs would result in improved fishing in the reservoir areas. The Milligan site is on a dry wash and does not now produce any fishing. The Apex site is now of little importance for fishing.

Storage provided in Reichle Reservoir for downstream release for fish would result in substantially improved and stabilized flows and an expected benefit to fish and fishing in the Big Hole and Jefferson Rivers. Flows recommended for fish in the Beaverhead River below Clark Canyon Reservoir would be met at all times except during periods of extreme drought under planned operation. Following development, including a fish excluder at Barratts Diversion Dam, the fishery would be essentially equal to that of the present.

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Winter flows in the Madison River between the Madison Diversion Dam and Ennis Lake would be reduced as a result of the planned operation of Hebgen Reservoir. This would result in a substantial reduction in production and catch of fish in the section of the Madison River below Madison Canal. A 6.5-mile reach of the river below the Lyon Canal would be nearly diverted for power production and its fishing would be lost. The section of river between Hebgen Reservoir and Lyon Canal and between the Lyon return and the Cameron Bench Canal would be benefited slightly from stabilization of flows. The over-all effect would be a loss of considerable significance. The Montana Fish and Game Department strenuously opposes proposed developments in the Madison subbasin in line with the view of the Senate Joint Memorial No. 4 of the Thirty-Fifth Montana Legislative Assembly in which objection was raised to further development on the Madison River which could jeopardize its recreational value.

A depletion of flow is expected in the Gallatin River with the additional ground-water pumping proposed for the Gallatin Unit. An impairment of the fishery is anticipated below Gallatin Gateway. It is expected that the impairment would gradually increase in severity until in the vicinity of Shedd's Bridge and for about 5 miles below, the fishery would be reduced to the depleted condition of the fishery that has prevailed for years in the lower part of the river between Shedd's Bridge and the confluence with the East Gallatin River. The above expectation is based on limited investigations. The Montana Fish and Game Commission has reserved final judgment on the effects of the Gallatin Unit until additional studies are made.

Construction and operation of the several units of the Three Forks Division would not greatly affect the wildlife resources of the area. Elk, moose, bighorns, and mountain goats would not be affected to any degree. Deer would lose some habitat due to construction of Reichle and Apex Reservoirs. Some deer and antelope would be displaced by conversion of over 93,000 acres of native range and dry-farmed agriculture land to an irrigation economy. Native grouse would be adversely affected by inundation of habitat in reservoir sites and conversion of native range to irrigation; but pheasants and Hungarian partridges, and waterfowl too, would be benefited from the conversion to an irrigation economy. Benefits to wildlife can be expected to accrue in connection with several units of the Division.

Fish and Wildlife Planning

Many provisions for the protection and development of fish and wildlife resources already have been included in the Three Forks Division plan. Specific facilities were incorporated as planning progressed. These include provision of storage in Reichle and Hebgen Reservoirs for maintenance of flows for fish in the river below each

reservoir; maintenance in all except extreme drought years of flows in the Beaverhead River at least equal to those recommended for fish; provision of a low-level outlet in Milligan Reservoir to permit periodic rehabilitation of the fishery; and inclusion of fish excluders at the various points of diversion in each river system.

Consideration also is being given to the desirability of removing the fish in the Big Hole River for 30 miles above Reichle Dam site and in about 50 miles of the Beaverhead River and tributaries above Clark Canyon Dam site at the time of closure of the dams to eliminate carp and other undesirable fish. This way, subsequent management would not be faced with the problem of uncontrollable competition and the period of high quality fishing could be extended. Studies on this aspect of planning on the Big Hole River has not reached the point of decision at this time.

Waterfowl make considerable use of the Three Forks area. Not only do trumpeter swans, Canada geese, and various ducks nest there, but a large number of waterfowl pass through it during migration. Because the area is so important to waterfowl, the Bureau of Sport Fisheries and Wildlife has an interest in developing one or more waterfowl refuges in the area. The Montana Fish and Game Department also is interested in development opportunities.

Several opportunities for development seem apparent, some in connection with the current water-resource planning for the Division and some only indirectly related to those plans. Studies conducted to date have been very preliminary in nature. Selection of likely sites for waterfowl-management areas has been only tentative. Further studies will be conducted as detailed planning for the various units get underway.

Waterfowl-development sites which have been tentatively selected are:

1. East Bench Area. 500-600 acres along the Beaverhead River below the East Bench Canal.

2. Twin Bridges Area. 5,000-6,000 acres lying between the Ruby and Beaverhead Rivers near the mouth of the Ruby.

3. Whitehall Area. 1,000 acres in an existing, partly drained marsh near Whitehall.

4. Lower Jefferson Area. 500-600 acres of oxbow and river-bottom marsh on both sides of the Jefferson River near the town of Willow Creek.

5. Milligan Reservoir Area. 600 acres at the head of Milligan Reservoir.

6. Three Forks Area. 12,000-15,000 acres of bottomland lying between the Madison and Gallatin Rivers at their juncture.

7. East Gallatin Area. 4,000 acres of bottomland along the East Gallatin River immediately above its confluence with the Gallatin.

8. Crow Creek Area. 800 acres of partly drained marsh located between Toston and Radersburg.

In addition to the above, there are a number of other areas as yet unknown in the Three Forks Division where return flows undoubtedly would collect. Detailed studies may demonstrate the feasibility of developing these areas as marshes for the enhancement of waterfowl and other wildlife instead of constructing deep drains to reclaim them for agricultural purposes.

Fortunately, many of the stream and game habitats in the Three Forks Division are now open to public fishing and hunting. Trends indicate, however, that more control over public use of these resources is to be expected on private lands in the future. Therefore, assignment of acquired land for any of the several uses to which it may be put should be carefully planned so as to provide for public use. Fish and wildlife have proven to be one of the greatest attractions around reservoirs. Land-use assignments should be subject to approval by representatives of the Montana Fish and Game Department and the Bureau of Sport Fisheries and Wildlife. To assure the fullest public enjoyment of the fish and wildlife resources of project areas, sufficient land must be acquired to provide for public access to the project areas. Too, wherever possible, access should be provided to canal and ditch rights-of-way for use by the sporting public.

Provision of additional storage at Hebgen Reservoir to alleviate the expected undesirable reduction in winter flows in the Madison River should be considered during detailed planning for use of Madison River water. Likewise, means of replenishing depleted flows in the Gallatin River must be considered at the time of detailed studies of the Gallatin Unit.

Preliminary plans for the Three Forks Division contain little information on the amount of silt that may be picked up and carried into the streams of the Division via the waste-water route. The adverse effects on fish resources of silt getting into the waters of the Division is of concern to the Montana Fish and Game Department and the Bureau of Sport Fisheries and Wildlife, and every consideration must be given to means and measures for prevention when detailed studies for the several units are made.

Since perpetuation and development of the fish and wildlife resources of the Three Forks Division has been set forth as a purpose of the project, it is expected that every consideration will continue to be given fish and wildlife and that any future plan or combination of plans will afford at least the degree of protection and development now included in the preliminary plan.

Recommendations

To accomplish the objectives set forth above and achieve a continued integration of features for protection and development of fish and wildlife into the project plan, the following recommendations are made:

(1) Cooperative planning similar to that done previously between the Bureau of Sport Fisheries and Wildlife and the Bureau of Reclamation during the course of the present investigation be continued for each individual unit so that specific measures for fish and wildlife conservation can be included in the final plans.

(2) Land acquisition for reservoirs should include sufficient land, beyond the minimum needed for irrigation, power, and flood-control purposes, not only to permit the fullest enjoyment of fish and wildlife resources but to provide for public access to the project area.

(3) Access should be provided to canal and ditch rights-of-way for use by the sporting public wherein possible.

(4) Acquired land should be made available for wildlife conservation and management.

(5) Every consideration should be given to means and measures for prevention of the return to the stream of silt-laden waste waters which may be damaging to fish resources.

(6) Such reasonable modifications should be effected in structures and operations as may be recommended by the Montana Fish and Game Commission and the Bureau of Sport Fisheries and Wildlife after the project has been constructed.

The Montana Fish and Game Commission has indicated a belief that insufficient information was available to permit the appraisal of project plans and make the listed recommendations. They recommend a number of investigations, designed to alleviate these inadequacies. The Bureau of Sport Fisheries and Wildlife is in concurrence with the need for additional studies prior to or at the time of detailed planning for individual units, and to that end is scheduling, in cooperation with the Fish and Game Department, such investigations as funds will permit.

Measures of Losses and Benefits

The cost of means and measures proposed as part of the Three Forks Division plan for the protection and development of fish and wildlife resources are set forth in the following table.

Costs of Means and Measures for the Perpetuation and Enhancement of Fish and Wildlife Resources,
Three Forks Division, Montana

Sub-basin, Unit, & Feature	Mitigation of Losses			Benefits		
		Cost			Cost	
	Measures for	Fish	Wildlife	Measures of	Fish	Wildlife
Jefferson Sub-basin						
East Bench Unit	Rehabilitation of 50 miles of stream above Clark Canyon Dam	$ 140,000 1/		Capitalized annual values from East Bench Report 2/		$ 36,616
	Storage of 78,200 acre-feet in Clark Canyon Reservoir for downstream fish flows	904,000 3/				
	Fish excluder, East Bench Canal	60,000 3/				
West Bench Unit				Single purpose alternative	$ 44,000 3/	
Whitehall & Jefferson Units	Storage of 318,300 acre-feet in Reichle Reservoir for downstream fish flows	1,400,000 3/		Storage of 318,300 acre-feet in Reichle Reservoir for downstream fish flows	637,000 3/ 4/	
Reichle Reservoir				Single purpose alternative		40,000 1/
Whitehall Unit	Fish excluder, Whitehall Canal	6,000 3/		Single purpose alternative		40,000 1/
Jefferson Unit	Fish excluder, Jefferson Canal	69,000 3/				
Crow Creek Area				Single purpose alternative		350,000 1/
Townsend Area				Single purpose alternative		270,000 1/
Milligan Reservoir				Single purpose alternative	350,000 3/	
Crow Creek Pump Unit				Capitalized annual values from Crow Creek Pumping Unit Report 2/		40,000 1/
Madison Sub-basin						
Lyon, Cameron Bench & Madison Unit	40,000 acre-feet of storage in Hebgen Reservoir for downstream fish flows	400,000 3/				
Lyon Unit	Fish excluder, Lyon Power Canal	65,000 3/				
Cameron Bench Unit	Fish excluder, Cameron Bench Canal	6,000 3/				
Madison Unit	Fish excluder, Madison Canal	76,000 3/				
South Bench Area				Single purpose alternative		80,000 1/
Gallatin Sub-basin						
Gallatin Unit 5/						

1/ Cost estimate furnished by the Bureau of Sport Fisheries and Wildlife.

2/ Annual values as were furnished by the Fish and Wildlife Service in these instances are actually estimates of sportsmen's expenditures in the area of concern.

3/ Cost estimates made by the Bureau of Reclamation.

4/ The cost of providing 318,300 acre-feet of storage for downstream fish flows would be $2,037,000. However, 318,300 acre-feet of storage would provide flows which would make possible an improvement in the fishery. On the basis of the percentage of acre-feet in excess of that needed to restore the fishery, the measure of benefits would be $637,000.

5/ Losses to fish are expected to result from flow depletions in the Gallatin River due to ground-water pumping under the Gallatin Unit, but no means of preventing or mitigating these losses were found during the limited studies that were made of this latest plan of development.

Because of the unusual and outstanding quality of the fish and wildlife resources of the Three Forks area, and their use by residents of practically every State in the Union, these resources are considered to be of national importance. Cost for their perpetuation and development as given in the above table are considered to be justified.

/s/ Leo L. Laythe

Leo L. Laythe

SUBSTANTIATING

REPORT

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INTRODUCTION

The Three Forks Division, which encompasses the drainages of the Jefferson, Madison, Gallatin, and Missouri Rivers above Canyon Ferry Reservoir, is one of the outstanding fish and wildlife areas in the country. It also has abundant water resources.

The Bureau of Reclamation has been studying the Three Forks area for at least the last 20 years with a view to developing its water resources for irrigation purposes. In the early 1940's they prepared a report [1] which inventoried possible sites for storage reservoirs, irrigation diversions, irrigation, and power development. Current planning includes provision for irrigation of 93,250 acres of new land and for a supplemental water supply to another 129,675 acres, entailing modification of stream flows and lands in all of the major drainages of the area. Planning by the Bureau of Reclamation has been under authority of the Act approved December 22, 1944 (58 Stat. 887).

Working under authority of the Act of August 14, 1946 (60 Stat. 1080; 16 U.S.C. 661) [2], the Bureau of Sport Fisheries and Wildlife has studied the effects of the more recent water-resource development plans on fish and wildlife resources and prepared this report. The report describes fish and wildlife resources of the Three Forks Division, discusses the effects of proposed water developments on these resources, and contains certain suggestions and recommendations designed to maintain or improve existing fish and wildlife resources of the area.

Engineering data upon which this report is based were supplied prior to and including September 1958, by the Region 6 and the Upper Missouri Projects Offices of the Bureau of Reclamation at Billings and Great Falls, Montana, respectively.

Personnel of the Bureau of Reclamation, the Montana Fish and Game Department, and local residents and sportsmen gave valuable assistance during field investigations and preparation of this report. Particularly appreciated is the interest and cooperation that has been shown by the Bureau of Reclamation in preparing the Three Forks Division plan so as to include features for the protection and development of fish and wildlife resources.

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[1] Bureau of Reclamation, 1942. Reconnaissance report on the Missouri River Basin, Three Forks to Canyon Ferry.

[2] Amended by the Fish and Wildlife Coordination Act approved August 12, 1958 (72 Stat. 563).

Previous reports prepared by the U. S. Fish and Wildlife Service which pertain to the Three Forks Division are as follows:

A preliminary evaluation report on fish and wildlife resources in relation to the water development plan for the Crow Creek Unit, Montana. October 1949.

A preliminary evaluation report on fish and wildlife resources in relation to the water development plan for the West Bench Unit, Jefferson Division, Montana. December 1949.

A two year fishery investigation, West Gallatin River, Montana, 1949-1950. March 1951.

Fish and Wildlife Service letter report amending "A preliminary evaluation report on fish and wildlife resources in relation to the water development plan for the Crow Creek Unit, Montana", dated October 1949. April 14, 1952.

Fisherman expenditure study, West Gallatin River, Montana, 1949-1950. May 1953.

Elk-hunter expenditures, Gallatin Area, Montana, 1954. January 1954.

Creel census and expenditure study, Madison River, Montana, 1950-1952. Special Scientific Report: Fisheries No. 126. April 1954.

Creel census and expenditure studies, Missouri River Basin 1947-52. Special Scientific Report: Fisheries No. 141. March 1955.

A detailed report on fish and wildlife resources in relation to the water development plan for the East Bench Unit, Three Forks Division, Montana. June 1956.

Summary of sportsmen's expenditures, Missouri River Basin. Special Scientific Report: Wildlife No. 126. March 1957.

Revision of "A detailed report on fish and wildlife resources in relation to the water development plan for the East Bench Unit, Three Forks Division, Montana". June 12, 1957.

DESCRIPTION OF THE THREE FORKS DIVISION

PHYSICAL FEATURES

The Three Forks Division, located in Beaverhead, Madison, Gallatin, Deerlodge, Silver Bow, Jefferson, Broadwater, and Meagher Counties in southwestern Montana, covers about 15,610 square miles (Map 613-604-600). It is bordered on the south and west by the Continental Divide and on the east by the Big Belt, Bridger, and Gallatin Mountains. The Madison, Gravelly, Ruby, and Blacktail Ranges and the Tobacco Root and Pioneer Mountains lie within the area. These mountains average about 8,000 feet in elevation with the highest peaks rising to more than 11,000 feet. The intermountain valleys are relatively high, ranging from 4,000 to 7,000 feet in elevation. Many of the mountains rise precipitously from the valleys, without a distinct zone of foothills. Elsewhere, they are bordered by high gravelly tablelands or, at lower elevations, rolling benchlands.

The Missouri River is formed by the confluence of the Jefferson, Madison, and Gallatin Rivers near the town of Three Forks. The Jefferson River and its major tributaries, the Big Hole, Beaverhead, and Boulder Rivers, drain about 9,580 square miles in the extreme southwest corner of Montana. Formed by the confluence of the Gibbon and Firehole Rivers in Yellowstone National Park, the Madison River has a drainage area of about 2,560 square miles consisting of mountains, high benches, and a rather narrow valley. The Gallatin River rises in the northwest corner of Yellowstone Park and together with its main tributary, the East Gallatin, drains an area of 1,830 square miles. The main stem of the Missouri River from Three Forks to Canyon Ferry Dam drains an area of approximately 1,640 square miles.

The climate of the Three Forks area varies from semi-arid in the valleys to sub-humid in the mountains. Annual precipitation ranges from less than 10 inches near Canyon Ferry Dam to more than 30 inches in the mountains near Yellowstone Park. Most of the precipitation in the higher mountains occurs in the form of snow. Temperatures range from a winter low of -64° to midsummer highs of above 100° . The growing season varies from 130 to 137 days. Prevailing winds are from the west and usually quite strong in the winter and early spring.

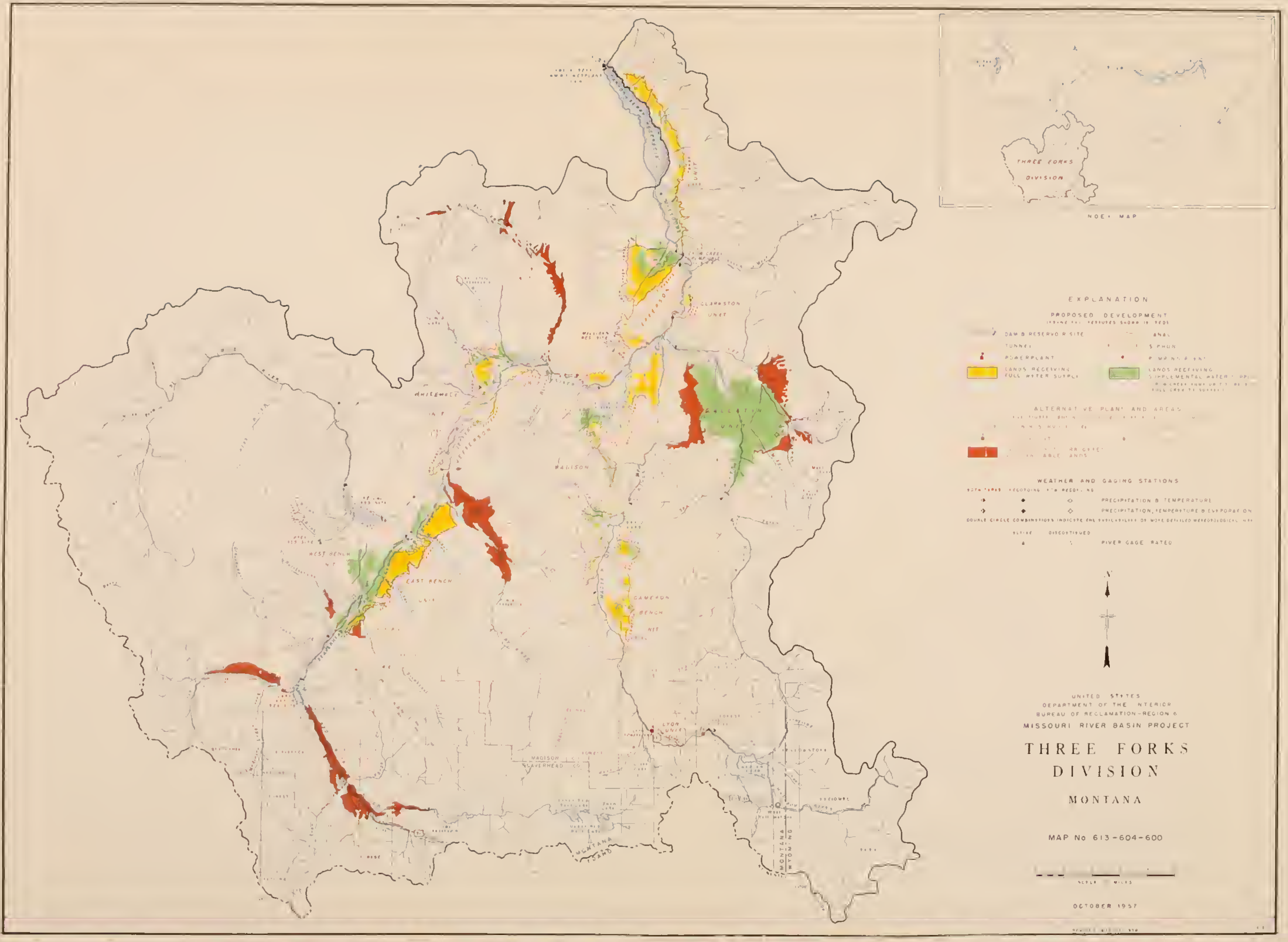
Forty-two percent of the land in the Three Forks Division is in private ownership, 6 percent is administered by the State of Montana, and 52 percent is property of the United States. The federal lands are administered as follows: Forest Service, 67 percent; Bureau of Land Management, 23 percent; National Park Service, 6 percent; Bureau of Sport Fisheries and Wildlife, 2 percent; and Bureau of Reclamation, 2 percent.

Excluding national forest lands, 79 percent of the land is used for grazing, 12 percent for cultivated crops, 8 percent for timber, and 1 percent urban, rivers, lakes, et cetera. National forest lands are used for multiple purposes including grazing, lumbering, mining, and recreation. Of the 12 percent in cultivated crops, 77 percent is irrigated and 23 percent is dry farmed. There are approximately 600,000 acres of irrigated land in the Three Forks area at present. The principal uses of the irrigable lands are for raising hay and small grains. Alfalfa and alfalfa-brome mixture are the principal hay crops; wheat is the predominant small grain. Potatoes, peas, and sugar beets are grown on a limited scale. Bottom lands that are poorly drained are used as wet-meadow pastures. Some of the benchlands that were previously cultivated have been replanted to grasses in recent years.

Shortgrass, bunchgrass, northern shrub, and coniferous forest are the major vegetative types in the Three Forks area. The shortgrass type generally occurs on the lower slopes, the bunchgrass on the next higher slopes, northern shrub next, and on the steep upper slopes of the mountains, the coniferous forest, composed of lodgepole, ponderosa, white bark, and limber pine, Douglas and alpine fir, and Englemann spruce. Cottonwoods, willows, wild rose, buffaloberry, and weeds and forbs grow along the streams. Aspens and other trees and shrubs are abundant in local areas along the streams. The northern shrub type is composed primarily of sagebrush, greasewood, and rabbitbrush, and bitterbrush.

The discovery of the rich placers of gold in Grasshopper Creek near Bannock in 1862 followed by other gold discoveries in the basin led to settling of the Three Forks section of Montana before any other area in the State. Ranching, farming, and lumbering was developed to supply the mining districts. Now, livestock raising, farming, and tourist activity are more important than mining. Lumbering is one of the least important of the industries of the Three Forks area. The excellent hunting and fishing in this scenic area contributes much to tourist activities which rank third as a source of revenue for Montana, and in the economy of local areas such as the Three Forks, rate even higher. There are seven factories located in the area for processing grain, vegetables, cement, and asbestos. In recent years gold, silver, copper, zinc, and lead have been the only metals mined in quantity. The mining of phosphorous and bentonite is increasing and should become important in the area's economy in the future.

The Three Forks area is sparsely populated. The population in 1950 was only 50,858 people. Of these, 37,800 lived in cities and towns and 13,058 lived on ranches and farms. The population per square mile ranged from 1.2 in Beaverhead County to 8.7 in Gallatin County. Madison, Jefferson, and Broadwater Counties had a population of 1.7, 2.4, and 2.4 persons per square mile, respectively. Bozeman, with 11,325 people, is the largest town in the area. Other towns



UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION—REGION 6
MISSOURI RIVER BASIN PROJECT

THREE FORKS
DIVISION

MONTANA

MAP No 613-604-600

OCTOBER 1957

range in size from McAllister with only 20 people to Dillon with a population of 3,268. Although not within the boundaries of the Three Forks Division, Anaconda (population 11,254), Butte (population 33,251), and Helena (population 17,581), because of their proximity, exert considerable influence on the area's economy and recreational use.

Good access to nearly all parts of the area is provided by federal and state highways. U. S. Nos. 10 and 10S cross the Division from Bozeman to Helena and Butte, U. S. Nos. 91 and 191 run north and south along the Beaverhead and Gallatin Rivers respectively. Montana State Highways 1 and 41 traverse the area from north to south and No. 34 crosses it from east to west, and numerous secondary state and county roads serve local communities. The Chicago, Milwaukee, St. Paul and Pacific Railroad traverses the area from east to west. The Northern Pacific Railway also crosses the area from east to west and has several branch lines connecting larger towns and market centers to the main line. A branch line of the Union Pacific Railroad crosses the area from its extreme southern tip to Butte.

FISH RESOURCES

Some of the most productive trout waters in North America are to be found in the Three Forks Division area. Hundreds of high mountain lakes and cold, clear mountain streams and the rivers into which these mountain streams flow offer excellent fishing (Map MO 1-9-11 and Fig. 1). Rainbow trout, brown trout, brook trout, and cutthroat trout are available throughout the area. Golden trout, mackinaw trout, and burbot are present in some of the lakes. One of the last strongholds of the Montana grayling is in the upper part of the Three Forks drainage. The Rocky Mountain whitefish provides a bountiful recreational fishery for local sportsmen through the winter. Although not considered sport species, suckers, Utah chubs, and carp are found in the Three Forks area too.

All these waters and all these fish, which offer opportunities for nearly any type of fishing (Fig. 2) one might want -- from still fishing to fly casting to spin casting--together with the natural attractiveness of the area (Frontispiece), generally excellent access to fishing water, and adequate lodging and camping facilities, makes the Three Forks area attractive to fishermen from all over the country. The vast majority fish the major rivers, and only a small percentage of the fishermen use the small streams and high mountain lakes.

Fishing is rapidly increasing all over the country, and present trends indicate that in years to come there most surely will be a much greater use of the Three Forks area. The increase in fishing license sales in Beaverhead, Gallatin, and Madison Counties bears

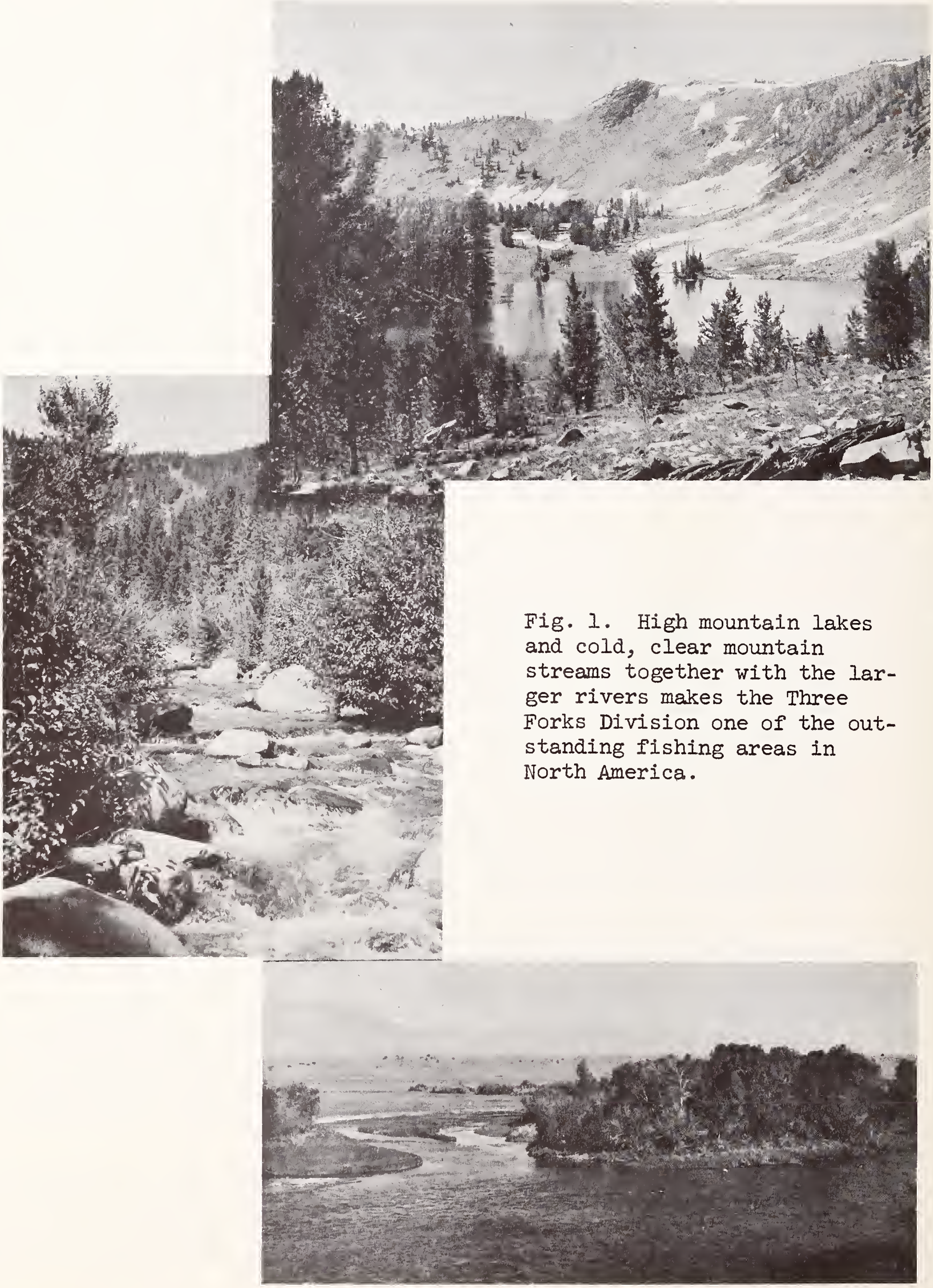
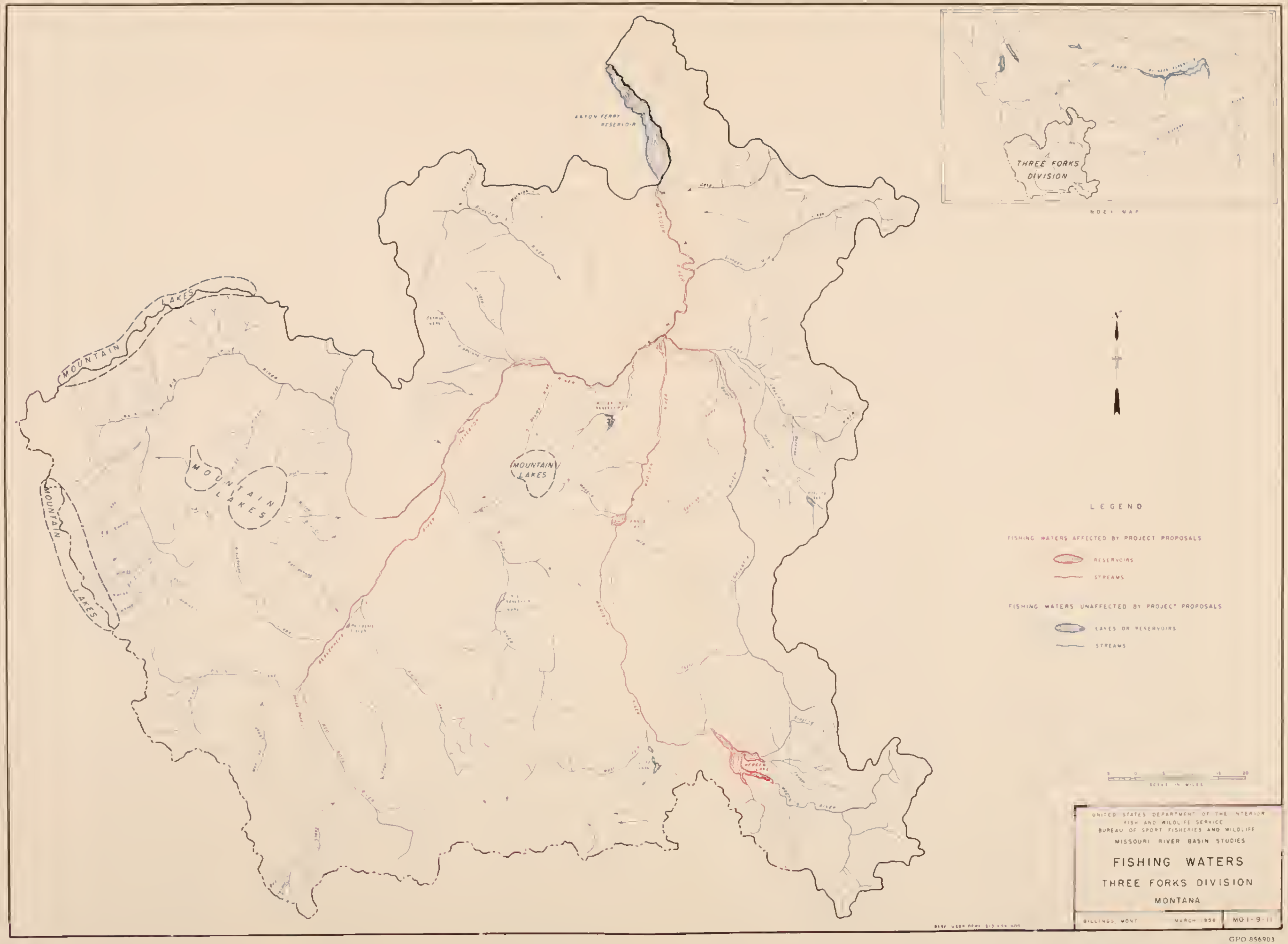


Fig. 1. High mountain lakes and cold, clear mountain streams together with the larger rivers makes the Three Forks Division one of the outstanding fishing areas in North America.



UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
MISSOURI RIVER BASIN STUDIES

FISHING WATERS
THREE FORKS DIVISION
MONTANA

BILLINGS, MONT MARCH 1958 MO I-9-11

GPO 856903

this out. These three counties, which cover a major part of the Three Forks area, have shown marked increases in both resident and nonresident fishing license sales during the past two decades. From 1935 to 1955 resident fishing license sales in these counties nearly doubled, when general population growth of the area was less than 20 percent. In the same period nonresident license sales rose 600 percent. Nationally, there was an increase of 150 percent in fishing license sales between 1939 and 1955.

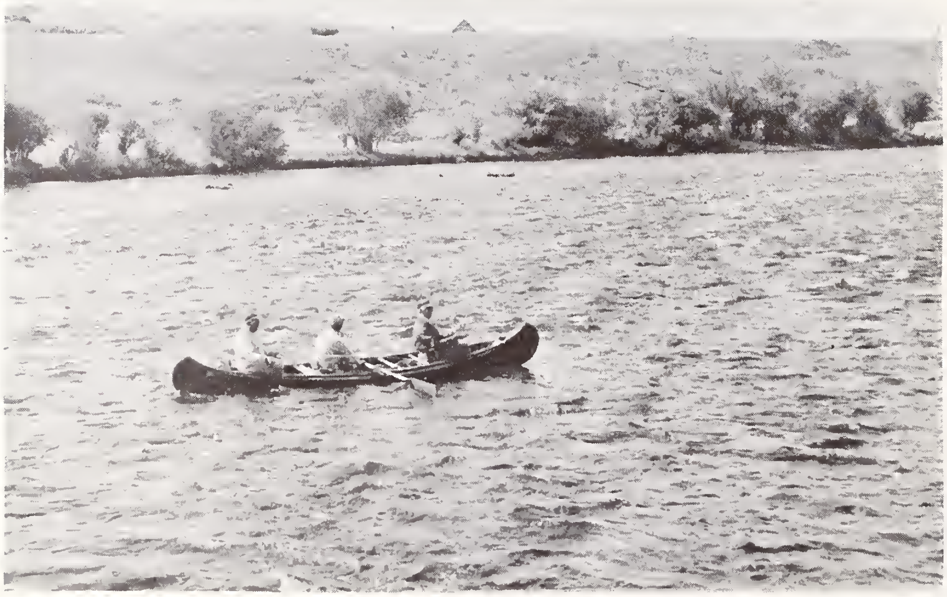
The five major streams most significant in their contributions to the fishery of the Three Forks area, and incidentally those streams which will be directly affected by proposed water-resource development, are the Madison, Gallatin, Beaverhead, Big Hole, and Jefferson Rivers (Map MO 1-9-11). A description of the fisheries of these rivers follows:

Of the five rivers, the Madison is the best known. In fact, the Madison is one of the better known trout streams of the West. Its fame rivals that of the nationally known Rogue in Oregon, the Gunnison in Colorado, and the Beaverkill in New York.

The Madison River heads a short distance inside Yellowstone National Park and flows for a distance of about 140 miles through a pleasant valley. Two dams have been constructed on the river for impoundment of water for power production. The first of these is the 13,380-acre, regulatory Hebgen Reservoir, located immediately outside Yellowstone Park. The second is Ennis Lake, a 3,800-acre impoundment, about midway between Hebgen Reservoir and the mouth of the river.

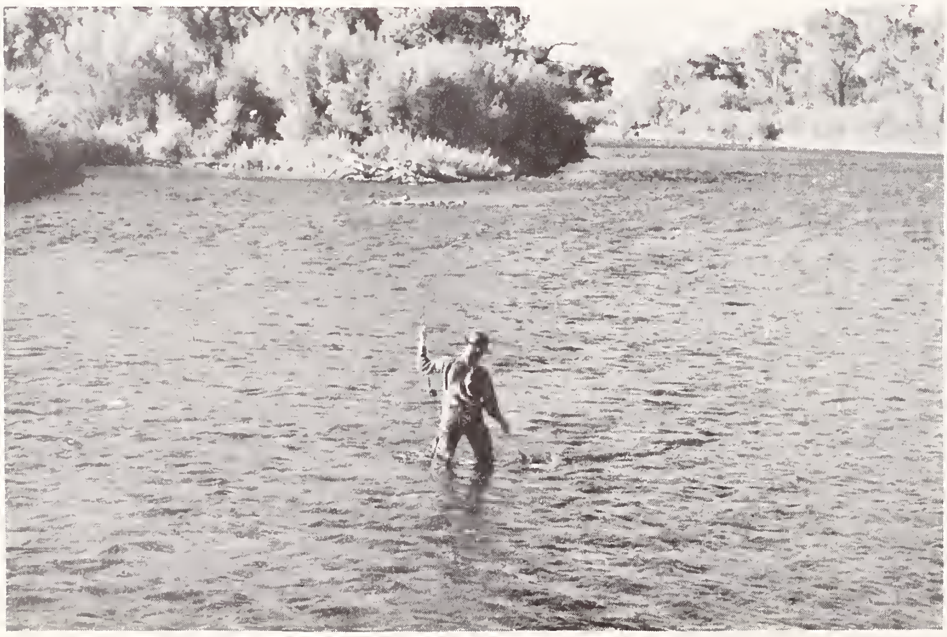
Rainbow and brown trout occur in both reservoirs and throughout the length of the river (Fig. 3). Brown trout are generally more abundant in the lower reaches of the river, while rainbow are more prevalent in the upper reaches. Cutthroat trout are found mainly in the upper half of the river. A few grayling and brook trout also occur in the Madison. Rocky Mountain whitefish which are common to the lower reaches of the river become less so as one progresses upstream. The Utah chub is an undesirable inhabitant of Hebgen Reservoir. Suckers are common to all reaches of the river and carp are found in the extreme lower reaches.

The entire length of the Madison River, except for one short reach below Ennis Lake, is paralleled or intersected by roads and car trails. Along the 15 miles of river immediately below Hebgen Dam there are many attractive public campsites. Tourist accommodations are available along most of the upper 80 miles of river, and the towns of Ennis and West Yellowstone offer shopping facilities as well as dining and sleeping accommodations for the angler.



MRBS 3132

Fig. 2. Waters of the Three Forks area offer any type of fishing one might want - from still fishing to fly casting to spin casting and from the ease of a boat to the hard work of wading.



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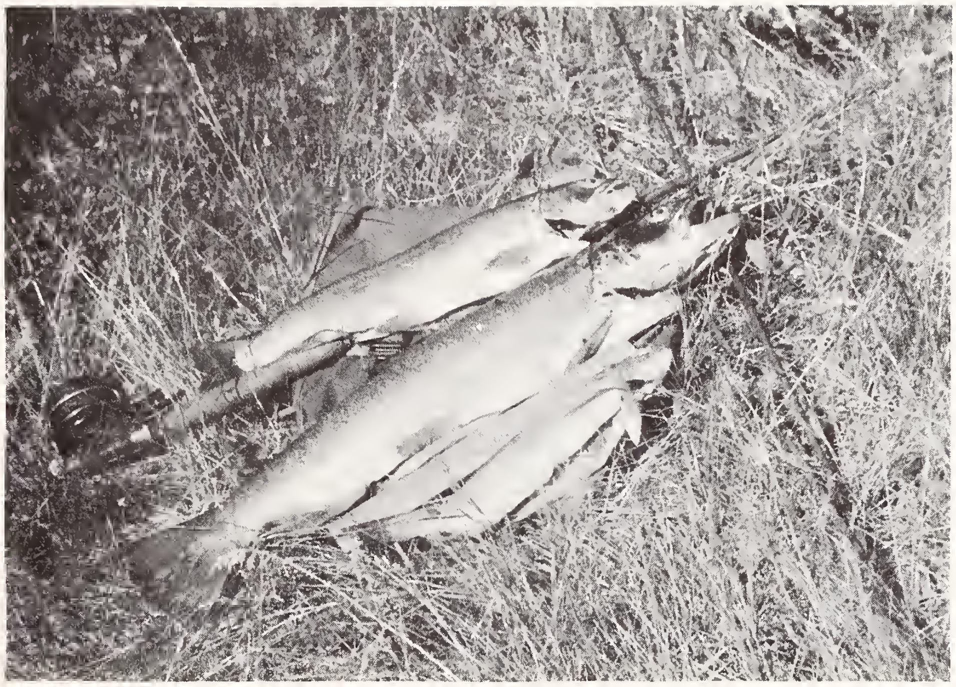

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Fig. 3. A nice creel of one brown and two rainbow trout from the Madison River. Note the 12-inch ruler between the lower two fish.

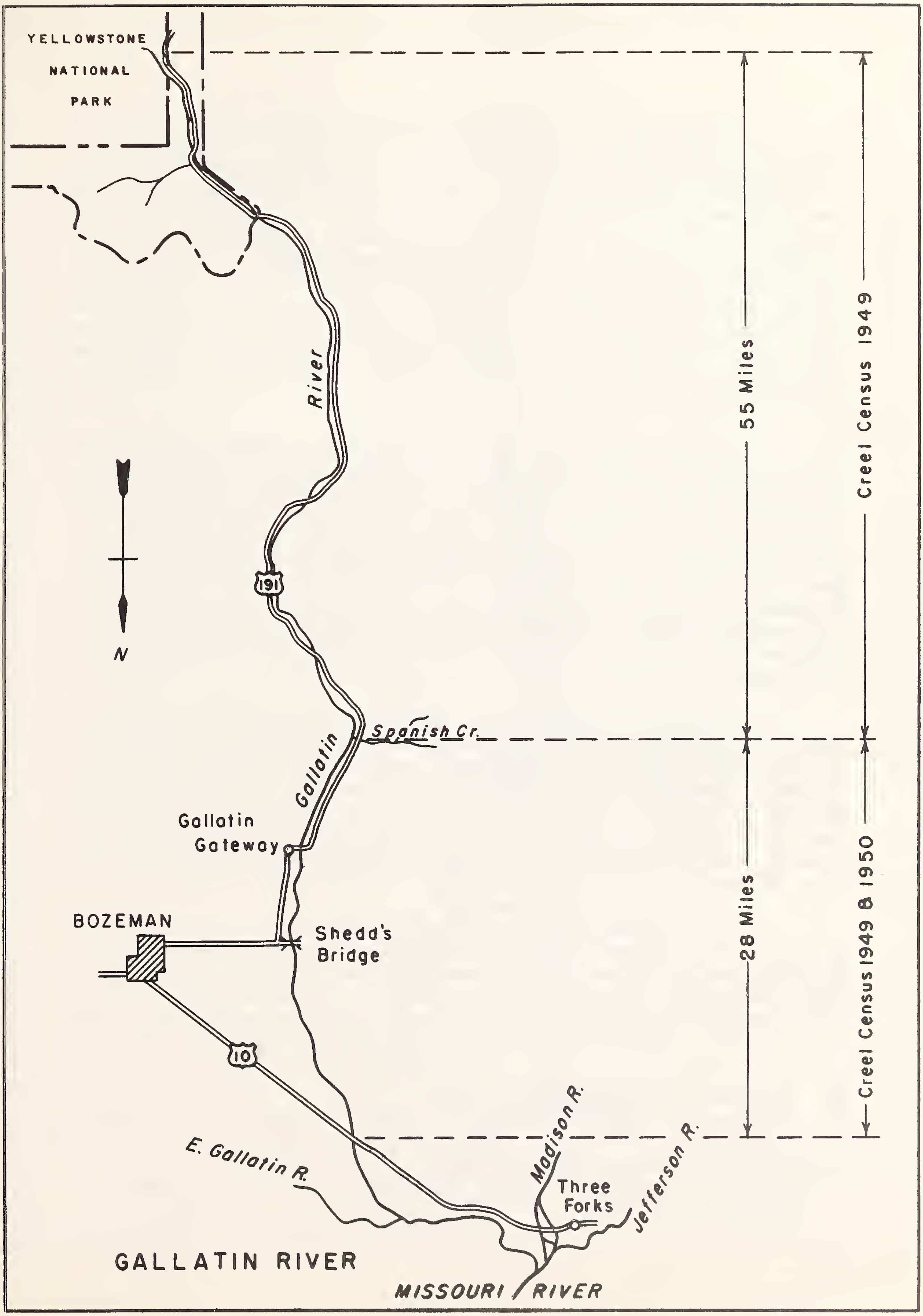
A creel census [3] conducted on the Madison River from 1950 to 1952 (Map MO 1-9-16) indicated that in those years over 80,000 pounds of fish were taken annually. On the average, fishing in the Madison produces about 1 fish or 1 pound of fish for two hours of effort. Two to 3-pound trout commonly are taken and 4 or 5-pound trout are not unusual. Fishing pressure was estimated at over 40,000 fisherman days annually during the period 1950 to 1952. Hebgen Reservoir and the 31 miles of river lying immediately below received 55 percent of its use from anglers nonresident to Montana. The next 34 miles received 22 percent of nonresident use. Studies made at the same time as the creel census of the daily expenditures of fishermen indicated an average expenditure of between $8.00 and $13.00 daily. The higher figure was obtained on the upper reach of the river and reflects the larger expenditures made by nonresidents. Application of the fishermen's average daily expenditure to estimates of fishermen-day use results in the estimate that nearly $500,000 were spent annually by fishermen using the Madison River during the period 1950 to 1952. This cannot be considered the value of the fishing; it is only an indication of its importance to the economy of first, the Madison Valley, and second, the Three Forks area.

Cost of fishing, like most other costs, have risen appreciably during the 5 years which have elapsed since the creel census was made. Despite this, it is readily apparent that there is greatly increased fishing on the Madison. And the importance of the stream, as measured by sportsmen's expenditures, also is increasing. Because the productive potential of the river is high and there is still room for fishing (the average annual fisherman-day use per mile of stream was only 231 in 1950 to 1952), it can be expected that the Madison will become increasingly important to the economy of the region in years to come.

The high productivity of the Madison is due to the balance of a combination of beneficial factors. These include flow, water temperatures, bottom conditions, distribution of riffles and pools, and food conditions. Changes in any of these factors could have adverse effects on the productivity of the river.

Although not so famous nationally as is the larger Madison River, that portion of the Gallatin River above its confluence with the East Gallatin River is well known for its excellent trout fishing. The Gallatin River is about 110 miles in length. It is known locally as the West Gallatin River.

3/ Fish and Wildlife Service, 1954
Creel census and expenditure study, Madison River, Montana, 1950-1952. Special Scientific Report: Fisheries No. 141.


YELLOWSTONE NATIONAL PARK
River
Gallatin
191
N
Spanish Cr.
55 Miles
Creel Census 1949
28 Miles
Creel Census 1949 & 1950
Gallatin Gateway
BOZEMAN
Shedd's Bridge
10
E. Gallatin R.
Madison R.
Jefferson R.
Three Forks
GALLATIN RIVER
MISSOURI RIVER

MO1-9-17

Shortly after leaving Yellowstone National Park, the river enters the highly scenic Gallatin Canyon, where it is paralleled by U. S. Highway No. 191. Public camp sites and tourist or fisherman accommodations are conveniently located along this stretch of stream. Being adjacent to U. S. Highway No. 191, one of the major routes to Yellowstone Park, this stretch of river receives considerable nonresident use (Fig. 4). In 1949 when a creel census [4] was made of the 55-mile reach of the upper Gallatin (Map MO 1-9-17); 32 percent of the fishermen were nonresidents. Rainbow and cutthroat trout and Rocky Mountain whitefish made up most of the catch. A few brook trout were taken. The rate of catch in the fast, cold waters of this reach of river was 1.07 fish per hour of effort. The average weight of the fish was about 1/3 pound.

A creel census was made on the 28-mile reach of the Gallatin below Spanish Creek in 1949 and 1950 (Map MO 1-9-17). This reach veers away from U. S. Highway No. 191 and, although it has adequate access via country roads, nonresident fishing dropped to about 6 percent of the total. Rainbow, brown, and brook trout made up the greater portion of the catch. Some cutthroat trout and Rocky Mountain whitefish, along with suckers, were taken. A small number of Montana grayling were recorded. The rate of catch in this section of stream was about 1/2 fish per hour. The average weight of all species taken was about twice that in the upper section or 2/3 of a pound each.

Fisherman-expenditures studies [5] conducted at the same time as the creel census indicated a daily expenditure of about $4.50 per day per fisherman in the 28-mile reach of river below Gallatin Gateway. This reach was used largely by residents of Montana. Application of the above figure to the estimated 12,100 fisherman-days use in the 28-mile section and the 15,000 fisherman-days use in the 55-mile upper section results in an over-all annual fisherman expenditure of over $120,000 for 83 miles of fishing water.

The extreme lower reach of the Gallatin, below the confluence with the East Gallatin, is productive of rainbow and brown trout, somewhat larger but in somewhat lesser numbers than in the area just above. Suckers and carp enter into the picture in this lower reach. Flowing as it does through an irrigated valley, access to this section is more restricted than further up the river.

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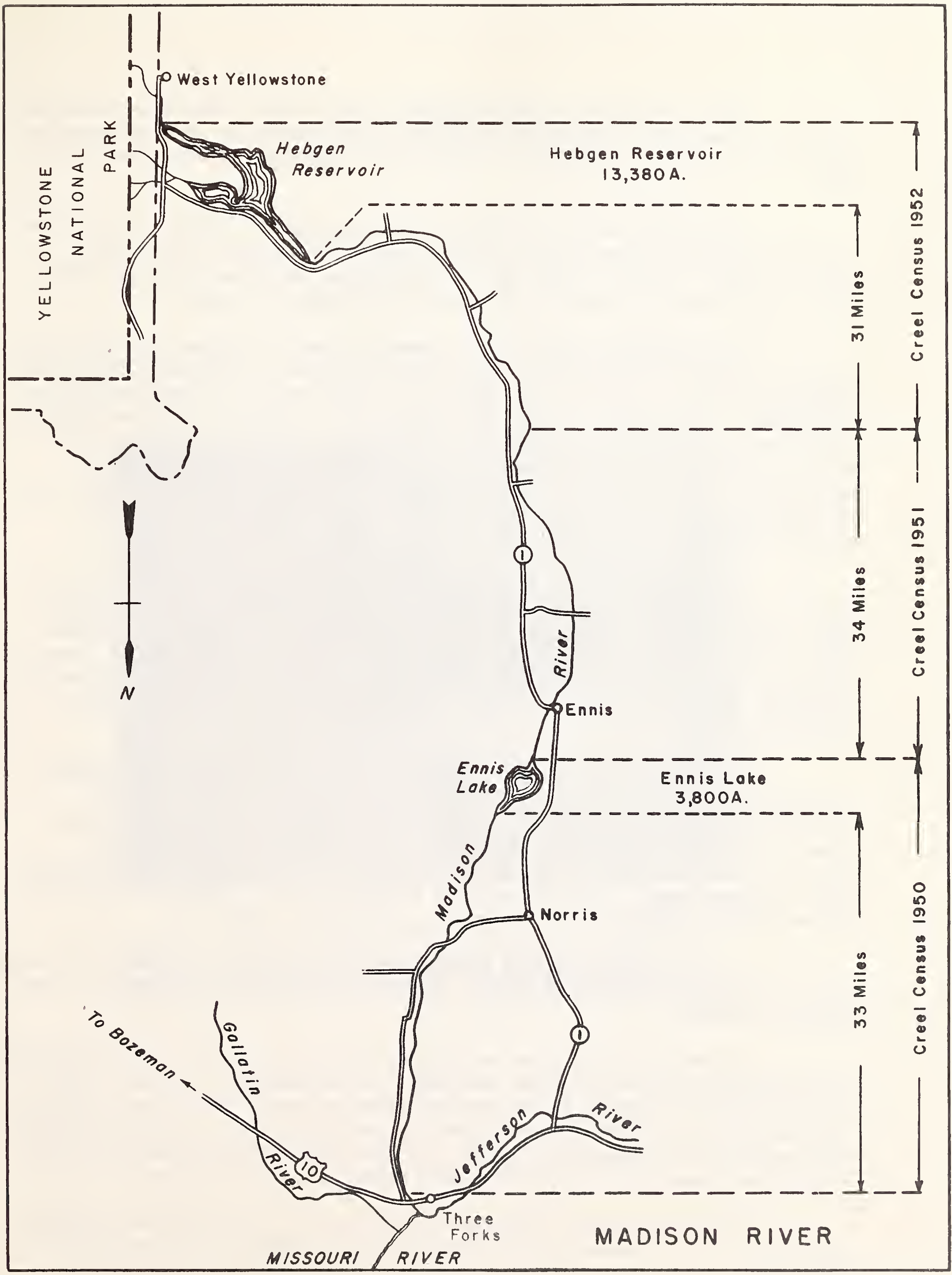
[4] Fish and Wildlife Service, 1951.
A two year fishing investigation, West Gallatin River, Montana, 1949-1950.

[5] Fish and Wildlife Service, 1953.
Fisherman expenditure study, West Gallatin River, Montana, 1949-1950.


West Yellowstone
YELLOWSTONE NATIONAL PARK
Hebgen Reservoir
Hebgen Reservoir 13,380 A.
31 Miles
Creel Census 1952
34 Miles
Creel Census 1951
N
Madison River
Ennis
Ennis Lake
Ennis Lake 3,800 A.
Norris
33 Miles
Creel Census 1950
1
To Bozeman
Gallatin River
10
Jefferson River
Three Forks
MISSOURI RIVER
MADISON RIVER

MO 1-9-16

Like the Madison, the Gallatin has a high productive potential and will accommodate many more fishermen; therefore, it too is expected to be of increasing importance in the future economy of the Three Forks area.

The Beaverhead is formed by the joining of the Red Rock River and Horse Prairie Creek about 2 miles north of Armstead. From this point it flows over 60 miles to its confluence with the Big Hole River near Twin Bridges, where the two form the Jefferson River.

The Beaverhead and its tributaries have a number of characteristics in common. They are clear, cold, permanent, of moderate to steep gradient, and are excellent producers of both trout and Rocky Mountain whitefish. The stream bottoms are composed of rubble, rock, and gravel, providing an abundance of aquatic foods and good spawning areas. The waters are fertile and well aerated by frequent riffles. Numerous deep holes, steep undercut banks, boulders, and bushy sections not only afford excellent cover for fish but also are important in creating interesting fishing waters.

The principal species of fish in the Beaverhead and its tributaries are rainbow, brown, eastern brook, and cutthroat trout, whitefish, and suckers. Grayling, burbot, and carp are present in the Red Rock and Beaverhead Rivers but not in great numbers. Rainbow and brown trout, together with whitefish, are abundant in the larger waters while cutthroat and eastern brook trout are important only in the smaller tributaries.

Trout fishing on the Beaverhead ranks high not only locally but on a national level as well. Nonresident use is quite heavy. In addition to the trout fishery, fishing for whitefish in the winter time is important. Many of the lands in the area are posted, but access is usually granted to those who ask. All-weather roads parallel most of the streams, and alternating stretches of cottonwoods and brush and mountain meadows provide numerous attractive campsites.

The rate of catch on the Beaverhead and its tributaries is high. Trout weighing a pound are common, and those weighing 3 pounds and over are not unusual.

Streams giving rise to the Big Hole River rise in the mountains of the Bitterroot and Pioneer Mountains of southwestern Montana. The river itself originates in the valley between these ranges near Jackson. It then follows a circuitous course of over 100 miles, a third of which lies near the southeastern side of the Anaconda-Pintlar Primitive Area, to its confluence with the Beaverhead River near Twin Bridges.

Like the other rivers described above, the Big Hole is highly productive. Pool areas are interspersed with riffle sections, with

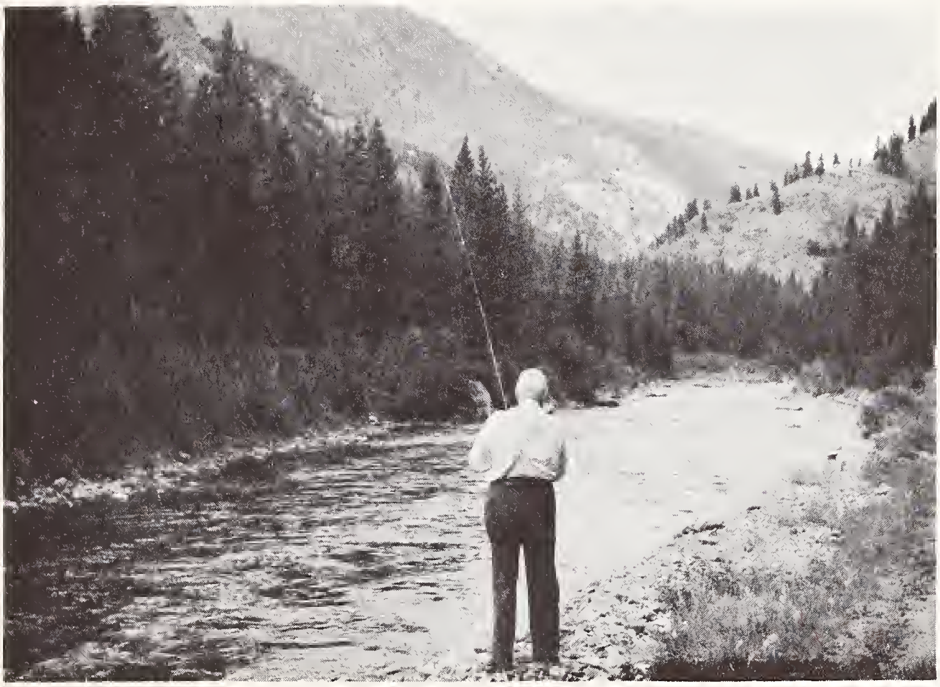


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Fig. 4. Many a tourist traveling U. S. Highway 191 between Bozeman and Yellowstone National Park succumbs to the lure of fishing in the Gallatin River which the highway parallels over much of its length.

rubble and boulder bottoms which are highly productive of fish-food organisms. Principal species above the Divide Dam, an early power dam which forms an effective barrier to upstream movement of fish, are rainbow, brook, and cutthroat trout, whitefish, and suckers. Rainbow trout, brown trout, whitefish, suckers, and some carp occur in the 45 miles of river below the Divide Dam.

The upper part of the river above the Reichle Reservoir site is readily accessible from U. S. Highway No. 91 and Montana State Highway No. 43. Attractive campsites are numerous along the entire river. Formal sportsman accommodations, such as are found along the Gallatin and the upper Madison Rivers, are extremely scarce. However, the towns of Butte and Anaconda, which are within an hour's drive of much of the Big Hole River, offer every modern convenience to the angler. The lower 15 miles of river are not so easily reached as is the upper section, but this highly productive section is not posted and many anglers use dirt trails which cross the surrounding rangeland to gain access.

All available evidence indicates a high rate of catch in the Big Hole, with many 2 and 3 pound trout being taken and a good number ranging from 5 to 10 pounds. The lower 40 miles of the river are heavily used by winter fishermen. The combination of many factors such as high productivity, generally good access, large fish, and year-long fishing makes the Big Hole River of extreme importance. Its importance undoubtedly will continue to grow.

Access to the Jefferson River is good throughout most of its 65-mile length. Most of the stream from its source at Twin Bridges to its terminus at Three Forks is paralleled or intersected by good roads. Those reaches which are not readily accessible from a highway or country road usually can be reached by means of dirt trails or ranch roads. Posting against fishing generally is no problem. Numerous small communities near the stream provide adequate accommodations for sportsmen.

Although productivity is not so great and the rate of catch not so attractive on the Jefferson as on the other major streams of the Three Forks area, large trout are commonly taken. The river is characterized by extensive pool areas. It supports rainbow and brown trout and Rocky Mountain whitefish. Considerable numbers of suckers and carp also occur in the Jefferson River.

Fishing in the Jefferson has not increased as rapidly as on the other major streams in the Three Forks area. Although it can, and in the years to come will support much more fishing than it does today, its relative position is somewhat below the other rivers in the area. The Jefferson's most important contribution to recreational fishing is through the easily accessible winter fishing which usually is available when other streams are closed by law (Fig. 5).

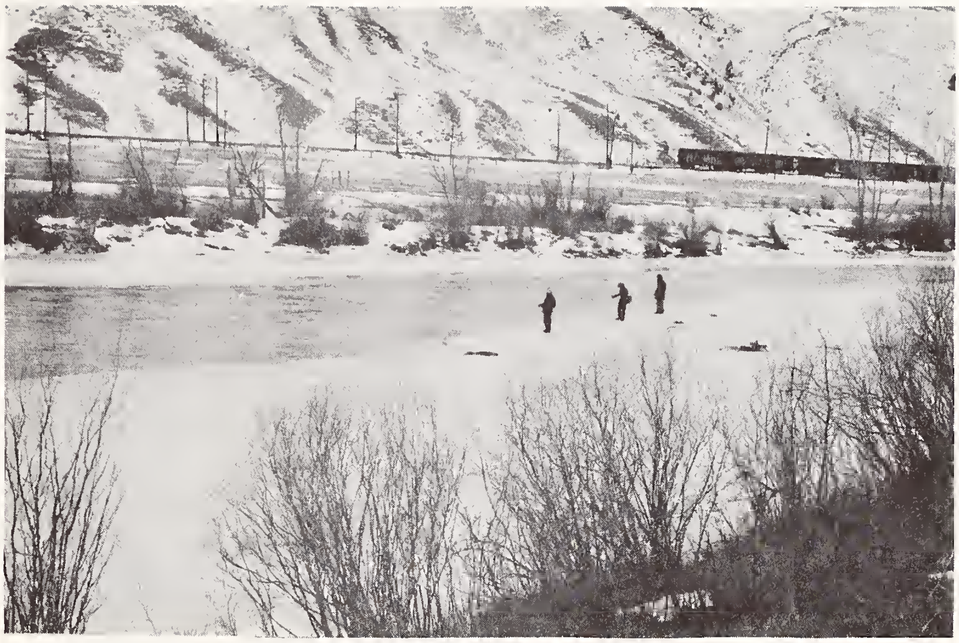

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Fig. 5. Fishing for Rocky Mountain whitefish is best in the winter. The Jefferson River is well known for its whitefish fishing.

WILDLIFE RESOURCES

The Three Forks Division also provides habitat for an abundance of wildlife. A great variety of big-game (Fig. 6), upland-game, fur-animal, and waterfowl species are to be found there, which all add to making the area extremely important to the hunters of Montana and, to a lesser but still important extent, to many hunters from throughout the nation.

The Gallatin, Madison, Gravelly, Snowcrest, Tobacco Root, Pioneer, and Anaconda-Pintlar Mountains provide year-round habitat for mountain goats, bighorns, moose, and bears, and summer range for elk and mule deer. The foothills furnish winter range for elk and mule deer. Antelope and some mule deer live year-round in the valleys and on the lower slopes of the foothills. There are a few white-tailed deer in the area.

Elk are among the most highly prized of the big-game species in the Three Forks area. Herds of these animals vary in size from a few individuals to groups of more than 1,000. The largest herds occupy the Gallatin and Gravelly Ranges.

With the many elk in the area there are lots of hunting opportunities. In the Gallatin and upper Big Hole drainages outfitters pack hunters back into the high country. The Gravelly Range and several other ranges are easily accessible by automobile and furnish hunting opportunities to many more elk hunters. The Gallatin and Gravelly Ranges are especially popular with nonresidents. The amount of nonresident use is increasing each year. An indication of the amount of recreation furnished by elk hunting is revealed by an examination of the Montana Fish and Game Department checking station data. Data collected at the Squaw Creek Station in 1954 shows that over 5,000 hunter-days were spent by elk hunters in the Gallatin area in that year. Checking station data for 1956 indicated that about the same number of hunter-days were spent in the Gallatin Canyon in that year. About 56 percent of the hunting pressure in 1954 originated within 150 miles of the hunting area. The other 44 percent of the pressure was from other parts of Montana and other states.

A limited expenditure study 6/ of elk hunters using the Gallatin Area during a special post-season hunt showed that each hunter spent a little over $12.00 per day and $254.00 for each elk taken. The $12.00 per day applied to 5,000 hunter days estimated for this area in 1954 and 1956 indicates an expenditure of around $60,000 annually.

6/ Fish and Wildlife Service, 1954.
Elk-hunter expenditures, Gallatin Area, Montana, 1954.

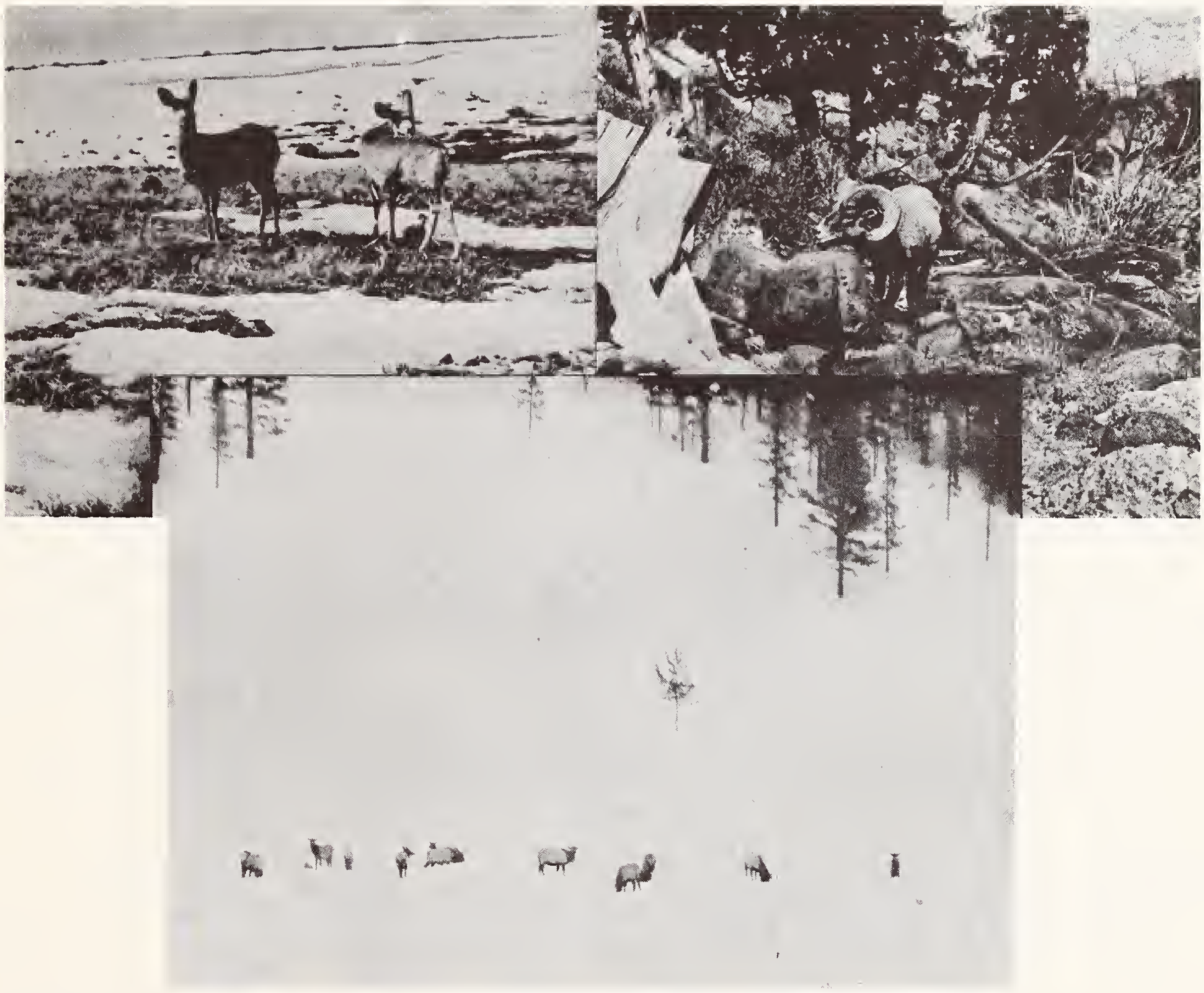


Fig. 6. The Three Forks Division area has an abundance of big game of many species. Big-game hunting in the Three Forks area is attractive to nonresidents as well as residents of Montana, and contributes much to the economy of the area.

Mule deer occur throughout the Three Forks area, from high timberline in summer to the foothills and flat cultivated lands in both summer and winter. Almost every square mile of land has deer on it sometime during the year. Currently most of the winter range is overpopulated with this species. Consequently, liberal bag limits allowing 2 deer per license holder, and longer hunting seasons have been provided so that hunters might take the surplus deer and keep the herds within tolerable limits. In order to further increase the take, nonresidents are permitted to purchase a special deer license costing $20.000 which is good in any of the 2-deer areas.

The largest populations of moose in Montana are found in the upper Big Hole and Beaverhead drainages. Large numbers also inhabit the Gallatin and Madison drainages. The total of 220 permits out of 412 (Table 1) which were issued for hunting moose in the Three Forks Division in 1957 demonstrates the importance of the area from the standpoint of this species.

Table 1. Special Hunting Permits Issued in Montana and in the Three Forks Division Area, 1957

Type	Number Issued	
	Montana	Three Forks Division
Moose	412	220
Mountain Sheep	50 1/	Unlimited
Mountain Goats	460 1/	60
Antelope	22,520	1,200

1/ In addition to these number of permits, there are areas in the State where an unlimited number of permits are available.

Bighorns are hunted in the Three Forks area on a permit basis too. During the past 2 years an unlimited number of permits have been issued. Only rams having horns with at least a three-quarter curl can be taken, thus preserving the trophy aspects of bighorn hunting. Hunter success has been relatively low in the Three Forks area, but the esthetic value of this type of hunting is high and few complaints are voiced by the hunters who participate. Bighorns are increasing in the upper Gallatin and Madison drainages, the important sheep ranges in the Three Forks Division. Mountain goat occur in the Pioneer, Anaconda-Pintlar, Madison and Gallatin Mountains. About 60 permits were issued for goat hunting in the Pioneer and Anaconda-Pintlar Mountains in 1957.

Antelope are found in small herds scattered throughout most of the Division area and provide hunting opportunities mostly for local residents. Around 1,200 permits were issued for antelope hunting in the area in 1957.

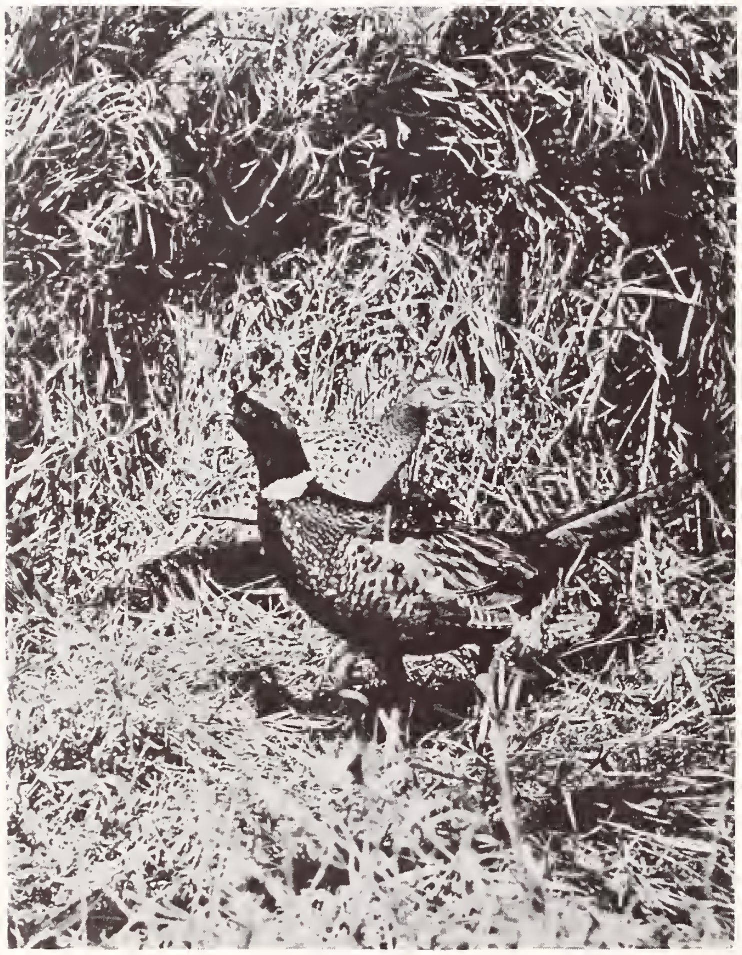
Rounding out the large variety of big-game animals in the Division are grizzly bears and black bears. A few grizzly bears range in the upper Madison and Gallatin drainages and a few lucky hunters collect these prized trophies each year, usually incidentally to an elk hunting trip. Black bears are common to all of the mountain ranges in the area. These animals seem to be increasing but the take by hunters remains relatively low.

From the preceding it can be seen that the Three Forks area includes a lot of big-game habitat. It is equal to some of the best in the Rocky Mountain region. More big-game hunters are using the area each year and nonresident hunters in particular have increased greatly during the past few years. An indication of the importance of this area from the standpoint of big-game hunting is contained in Table 2. This table shows for 1955 by seven counties in the Three Forks area the sale of combination resident bird and fishing licenses, which are a prerequisite to the purchase of a resident big-game license; the sale of resident big-game licenses; sale of nonresident bird licenses; and sale of nonresident big-game licenses. In 1955, a total of 189,449 resident bird and fishing licenses and 124,932 resident big-game licenses were sold in Montana. The 20,174 resident big-game licenses sold in the seven counties shown in Table 2 constitute 16 percent of all such licenses sold in the State in that year.

Table 2. Hunting and Fishing Licenses Sold in Seven Counties in the Three Forks Division, 1955

Counties	Resident Bird & Fish License	Resident Big Game License	Nonresident Bird License	Nonresident Big Game License
Beaverhead	2,961	2,016	1	100
Broadwater	1,268	846	1	11
Deerlodge	4,608	2,544	23	0
Gallatin	8,594	5,757	10	241
Jefferson	1,221	865	0	9
Madison	2,284	1,417	7	40
Silver Bow	13,431	6,729	2	37
Total	34,367	20,174	44	438

Coniferous forest, sagebrush-grassland, and cultivated farms provide the main upland-game habitat in the Three Forks area. Each of the major river drainages contains varying proportions of these habitat types and upland-game populations associated with each.



(James Kimball Photo)

Fig. 7. The ring-necked pheasant is the most important upland-game bird in the Three Forks Area.

Three species of grouse, the ruffed, blue, and Franklin, inhabit the forested mountains. Sharp-tailed grouse occur in the foothills and benchlands, ordinarily close to where dryland wheat is grown. Sage grouse are most numerous in the foothills of the Madison, Jefferson, and Missouri drainages. Hungarian partridge and pheasant populations (Fig. 7) occur in most of the cultivated areas. The best pheasant areas are along the lower Gallatin River and the Missouri River near Townsend. Mourning doves nest in the river bottoms and foothills along all the major tributaries. Chukar partridges have been planted along the Jefferson and Big Hole Rivers and appear to be increasing.

Hunting seasons of 2 to 3 weeks in length are usually provided for all upland-game birds except chukar partridges and mourning doves. Dove hunting is not permitted in Montana, but birds raised in the State contribute to the take of doves in other states. Hunting of Chukars has not been permitted as yet. Most upland-game hunting is of pheasants and prairie grouse, although an increase in the hunting of mountain grouse has been noticeable lately. Hungarian partridges are often shot by hunters seeking pheasants. Cottontail hunting is enjoyed by many hunters, especially during the closed seasons for other species.

Because of the variety of habitats in the Three Forks there are many species of fur animals. Foxes, badgers, skunks, weasels, beavers, minks, and muskrats are common to most of the area. Pine martens are found in the high spruce-fir forests of the upper Gallatin, Madison, and Jefferson drainages. Otters occur along the larger rivers. A wolverine was killed near the town of Sheridan in the summer of 1957.

The best fur-producing areas are in the main river bottoms where minks, muskrats, and beavers are numerous. Beaver tapping is controlled by allotting a specific area to a trapper and assigning a quota of animals to be trapped. A quota of about 2,400 beavers was set for the entire Three Forks area in 1957.

Large numbers of waterfowl migrate through the Three Forks area. Pintails, gadwalls, baldpates, shovellers, redheads, canvasbacks, lesser scaups, ruddy ducks, snow geese, whistling swans, and coots are common migrants. Canada geese, mallards, blue-winged teal, green-winged teal, cinnamon teal, and American mergansers nest there.

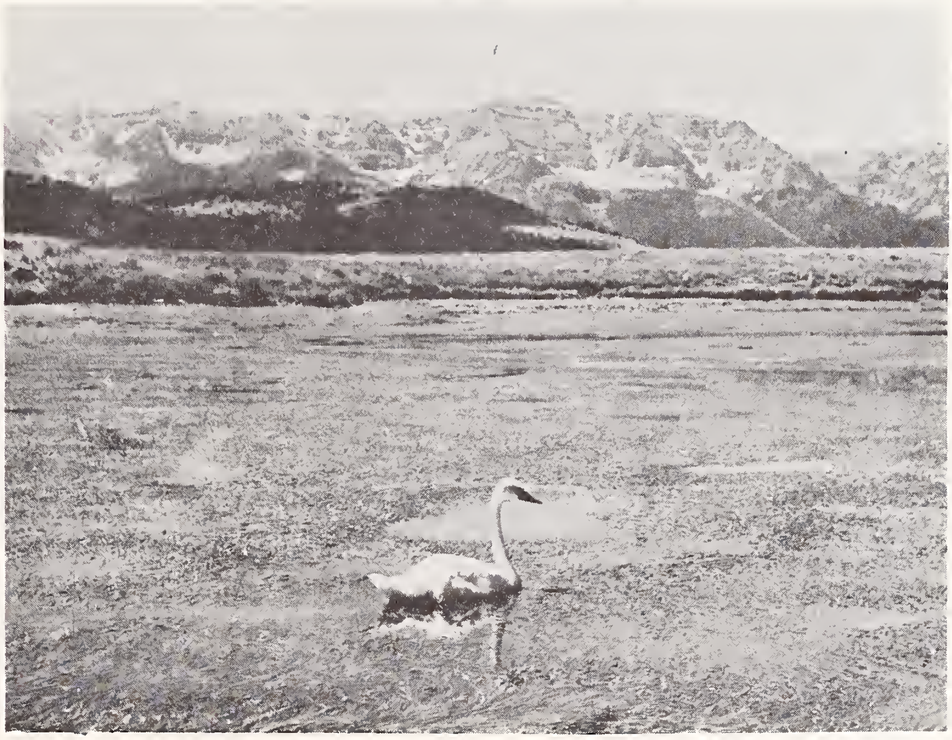
The Missouri River is a natural thoroughfare along which waterfowl migrate. The head of the Missouri River at Three Forks is a natural collection point for ducks and geese. Birds tend to spread out along all three of the rivers converging there. Numerous adjacent grainfields provide adequate feeding grounds.

Most duck and goose hunting in the Three Forks is done by jump shooting. A few hunters use decoys at selected spots in the rivers or in grainfields in which ducks and geese are known to feed. The Madison drainage is a favorite spot for hunting Canada geese 7/.

Ducks remain through the hunting season on the warm-spring flows and the marshes and sloughs near Manhattan and Belgrade in the lower Gallatin River drainage. These areas are considered among the best duck-hunting spots in Montana. Abundant grainfields on Anceney Bench and Springhill Bench in the Gallatin Valley furnish ideal feeding areas for ducks. Mallards comprise the bulk of the duck hunter's bag.

Among the host of nongame birds which either nest in the area or migrate through it and which cannot be disregarded in appraising the wildlife resources of the Three Forks Division, there are two species that are of special interest. These are the trumpeter swan and the long-billed curlew. Conservationists have focused national attention on the Red Rock Lakes National Migratory Waterfowl Refuge since its inception in 1935. The history of that refuge is the history of the trumpeter swan from a period when it bordered on extinction to the present time when the species is believed to be out of danger (Fig. 8). In recent years, swans have been transplanted from Red Rock Lakes to other suitable areas. Long-billed curlews, although not in the vanishing species group of birds, have had their nesting habitat drastically reduced through plowing of the prairie. The Three Forks area fortunately provides nesting habitat for thousands of these birds.

7/ Madison, Gallatin, and Beaverhead Counties are closed to snow-goose hunting in order to protect trumpeter swans.



(Milton Borges Photo)

Fig. 8. Trumpeter swans, once nearly extinct, were saved by establishment of the Red Rock Lakes National Waterfowl Refuge. Hunting of snow geese is prohibited in Gallatin, Madison, and Beaverhead Counties of the Three Forks area to further protect these majestic birds.

FISH AND WILDLIFE AND THE THREE FORKS DIVISION

Development of the Three Forks Division as suggested by the Bureau of Reclamation for the purposes of irrigation, flood control, power development, fish and wildlife, and recreation may be considered by the three major sub-basins of the Division: (1) the Jefferson, including that portion of the Missouri River drainage between the town of Three Forks and Canyon Ferry Dam, (2) the Madison, and (3) the Gallatin.

Plans include on-stream reservoirs on the Big Hole and Beaverhead Rivers, a small on-stream reservoir on Birch Creek, and an off-stream reservoir in a small canyon tributary to the Jefferson River. Plans provide for a power diversion on the Madison River and irrigation diversions on the Madison, Jefferson, Big Hole, and Beaverhead Rivers. Also included are plans for ground-water pumping in the Gallatin Valley and a pumping plant on the Missouri River. The over-all plan is shown on Map No. 613-604-600 (page 5).

Acreages to be served by the developments include 93,520 acres to receive a full water supply and 129,675 acres to receive a supplemental water supply (Table 3).

Table 3. Irrigation in the Three Forks Division

Sub-basin, Unit and Area	Irrigable Acreage	
	Full Water Supply	Supplemental Water Supply
Jefferson River Sub-basin		
East Bench Unit	21,800	28,004
West Bench Unit	0	6,714
Whitehall Unit	6,695	3,881
Jefferson Unit		
Upper Jefferson Area	1,550	0
Lower Jefferson Area	2,080	0
South Boulder Area	0	792
Valley View Area	2,355	195
Crow Creek Area	15,040	7,773
Townsend Area	21,365	6,430
Crow Creek Pump Unit	5,020	0
Clarkston Unit	985	0
Madison River Sub-basin		
Cameron Bench Unit	4,030	3,140
Madison Unit		
Ennis Area	0	5,230
Harrison Area	0	8,420
South Bench Area	12,600	0
Gallatin River Sub-basin		
Gallatin Unit		
Groundwater Pumping	0	59,096
Total	93,520	129,675

JEFFERSON RIVER SUB-BASIN

Plans for the Jefferson River Sub-basin include the East Bench Unit and its Clark Canyon Reservoir, West Bench Unit and Apex Reservoir, Whitehall and Jefferson Units with Reichle and Milligan Reservoirs, and the Clarkston Unit (Maps MO 1-9-12 and MO 1-9-13). Plans for each of the above units will be discussed in more detail below, followed in each instance by a discussion of the effects of each on (1) fish and (2) wildlife.

East Bench Unit
(Map MO 1-9-12)

Plan of Development

Although included in the over-all plan for the Three Forks Division, planning by the Bureau of Reclamation for the East Bench Unit on the Beaverhead River, consisting of Clark Canyon Reservoir and 49,800 acres of irrigable land (21,800 acres to receive a full supply of water and 28,004 acres to receive a supplemental supply), is considerably advanced over that for other units in the Division. The Bureau of Reclamation has prepared a Definite Plan Report for the East Bench Unit.

Clark Canyon Dam, to be built about 2 miles north of Armstead, will form a reservoir of about 5,000 acres at the top of irrigation pool (Table 4).

Table 4. Clark Canyon Reservoir Data

Item	Elevation (ft.m.s.l.)	Capacity (acre-ft.)	Surface Area (acres)
Top of Flood Control Storage	5560.4	261,000	5,900
Top of Irrigation Storage	5542.1	161,000	5,000
Top of Inactive Storage	5470.6	2,000	210
Outlet Invert Level	5463.0	900	122
Stream Bed	5445.0	0	0

Expected flows in the 18-mile reach of the Beaverhead River between Clark Canyon Dam and Barratts Diversion Dam will vary from about 200 c.f.s. in the winter to 590 to 700 c.f.s. in the spring and summer under project conditions. Flows in the river below Barratts Diversion are expected to vary from a winter low of 220 c.f.s. to between 220 and 380 c.f.s. in the summer. An allocation of 78,200 acre-feet of storage for fish flows has been made.

Provision for a fish-excluder device at the head of the 440-c.f.s. East Bench Canal to prevent loss of fish into the canal has been included in the project.

Fish [8]

Trout fishing in the Beaverhead River ranks high not only in Montana and the northern Rocky Mountain Region but nationally as well. The principal species of fish in the Beaverhead are rainbow, brown, brook, and cutthroat trout, Rocky Mountain whitefish, and suckers. Grayling, burbot, and carp are present but not in great numbers. Fishing in the Beaverhead constitutes the principal tourist attraction of the area and has steadily strengthened the position of the tourist industry as the area's second-best moneymaker (Fig. 9).

Important stream fisheries in 7.5 miles of the Red Rock River, 2 miles of Decker Pond Creek, 8.6 miles of Horse Prairie Creek, and 0.3 mile of the Beaverhead River would be inundated with construction of Clark Canyon Dam and Reservoir. Due mainly to an expected annual drawdown of as much as 80 feet, and in part to an expected bloom of carp, Clark Canyon Reservoir is expected to produce considerably less fishing than the streams to be inundated.

Flows in the Beaverhead River below Clark Canyon Dam and below Barratts Diversion Dam would have been seriously reduced under early plans for operation of Clark Canyon Reservoir. Due to the adverse effect they would have had on fish, the Fish and Wildlife Service recommended a 250 c.f.s. minimum flow between Clark Canyon Dam and Barratts Diversion Dam during the nonirrigation season and a 200 c.f.s. minimum flow between Barratts Diversion Dam and the mouth of the Ruby River during the irrigation season. The Bureau of Reclamation extended and modified its operation study to an extent that flows would be such that the fish productivity of the river above the diversion dam would approximate that under historical conditions.

Analysis of the extended operation study indicates that stabilized flows of about 200 c.f.s. would occur in the 18-mile reach of the Beaverhead between Clark Canyon Dam and Barratts Diversion Dam from October to April. Spring and summer flows would rise to about 590 c.f.s. in June, and 700 c.f.s. in July and fall to 440 c.f.s. in August. During extended periods of extreme drought, winter flow in this reach may be as small as 25 c.f.s. Fortunately extended periods of severe drought are not likely to occur very frequently.

As indicated above, the productivity of the Beaverhead between Clark Canyon Dam and Barratts is expected to be essentially as under

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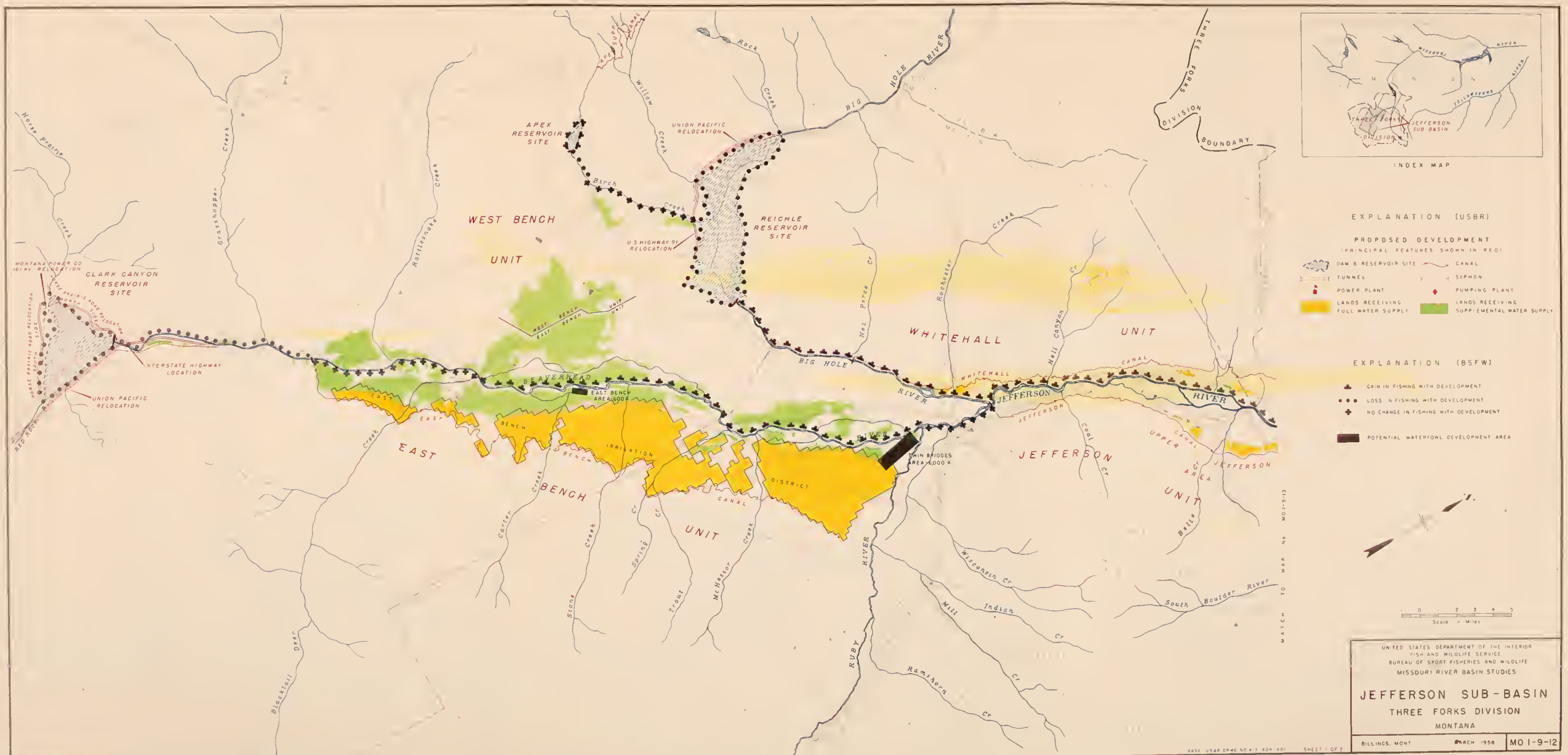
[8] An analysis of the effect of construction of the East Bench Unit on fish and wildlife resources is contained in: "A detailed report on fish and wildlife resources in relation to the water development plan for the East Bench Unit, Montana" dated June 1956, and a letter of revision, dated June 12, 1957.



UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
MISSOURI RIVER BASIN STUDIES

JEFFERSON SUB-BASIN
THREE FORKS DIVISION
MONTANA

BILLINGS, MONT   MARCH 1958   MO 1-9-12

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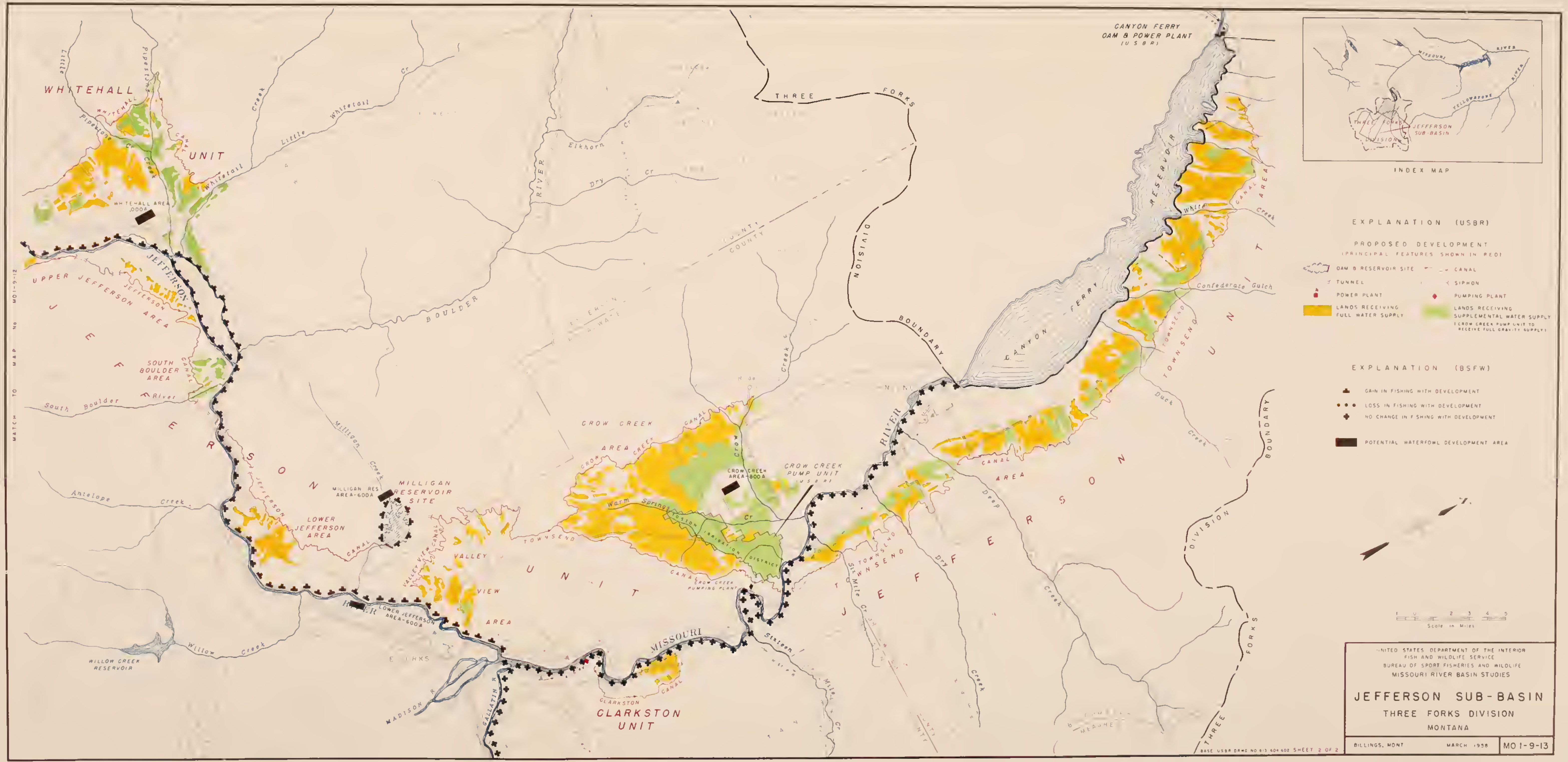

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MONTANA

BILLINGS, MONT MARCH 1958 MO 1-9-13

GPO 856903

historical conditions and therefore no material difference in the fishing between with and without-the-unit conditions would be expected. However, the 400-c.f.s. East Bench Canal at Barratts Diversion Dam is expected to result in loss of fish from the river to an extent that fishing above the Diversion Dam would be adversely affected to a considerable degree. Provision of a fish excluder at the point of diversion into the canal, now included as part of the plan of development, would offset this loss.

Flows in the river below Barratts Diversion are expected to vary from a winter low of 220 c.f.s. to between 220 and 380 c.f.s. in the summer. Winter low flows of as little as 60 c.f.s. may be expected during the infrequent extreme drought periods. No change in fishing is expected in the 12-mile reach of river between Barratts Diversion Dam and Dillon, and the 3-mile reach between the mouth of the Ruby River and the mouth of the Big Hole River. The 27-mile reach between Dillon and the mouth of the Ruby River would be benefited slightly.

Wildlife [9]

Mule deer, antelope, ruffed grouse, sage grouse, Hungarian partridge, a few pheasants, cottontails, muskrats, beavers, and several waterfowl species inhabit the Clark Canyon Reservoir site and the East Bench irrigable area. Under existing conditions these birds and mammals offer limited hunting for local hunters.

With development of the unit, habitat for most of the species listed above would be destroyed or changed in the reservoir site and there would be a loss of these animals. Waterfowl would be benefited slightly with impoundment of the reservoir which would provide a resting place for these birds during migration. Waterfowl also are expected to benefit slightly from the development of seeps and over low areas on the irrigated areas.

The change in the environment on the irrigable area from a grassland or dry-farmed condition to a situation where there would be a greater diversification of crops, smaller fields, and weed-grown fence rows and ditch and canal banks, would be beneficial to pheasants. With irrigation of 21,800 acres of new lands, pheasants are expected to increase and provide considerable hunting for the local people.

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[9] See footnote 8, page 32.

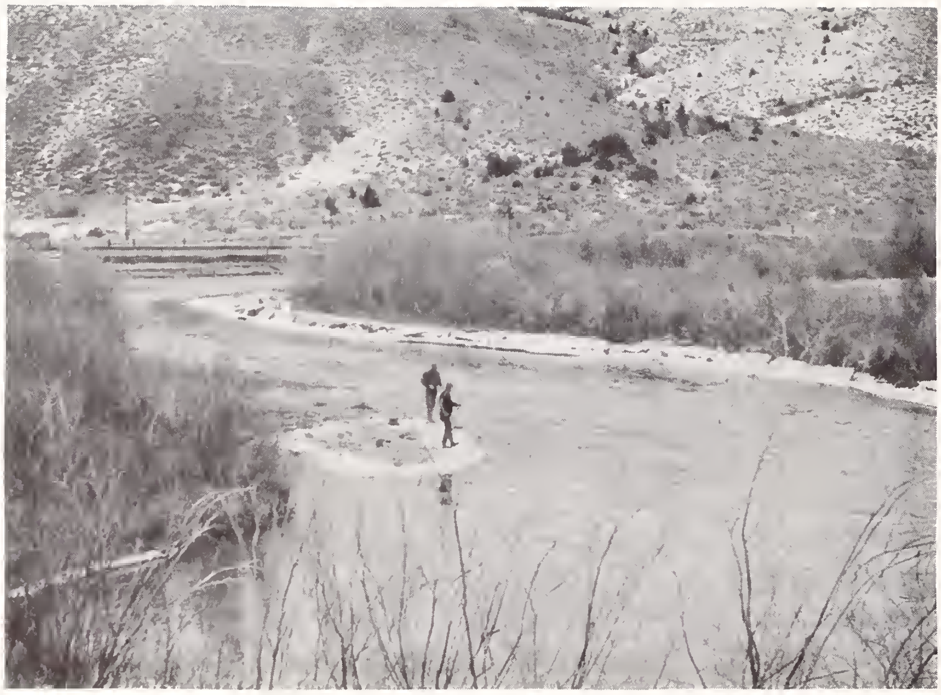

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Fig. 9. From the proposed Clark Canyon Dam site downstream to Dillon, the meandering Beaverhead River is almost a continuous succession of pools and riffles that is as fine for winter whitefish fishing as it is for trout fishing in the summer.

West Bench Unit
(Map MO 1-9-12)

Plan of Development

A principal feature in the development of the West Bench Unit is the Apex Dam and Reservoir, a single-purpose structure to store and regulate stream flows for use in irrigation. Apex Dam will be located on Birch Creek about 10 miles upstream from its confluence with the Big Hole River.

Storage allocations and operational data for Apex Reservoir are shown in Tables 5 and 6, respectively.

Table 5. Apex Reservoir Storage Allocations

Storage Purpose	Storage (acre-ft.)
Conservation	7,540
Dead and Inactive	70

Table 6. Apex Reservoir Data

Item	Elevation (ft. m.s.l.)	Capacity (acre-ft.)	Surface Area (acres)
Maximum Pool	6011	7,610	128
Average Annual Maximum Pool	6008	7,250	126
Average Annual Minimum Pool	5964	2,820	74
Stream Bed	5870	---	---

Releases from Apex Reservoir during the irrigation season will be adequate to satisfy existing water rights and to provide supplemental water to lands of the West Bench Unit. Releases during the winter will result in flows of approximately 1.7 c.f.s. in Birch Creek below Apex Dam, slightly less than under historical conditions.

Existing diversion and distribution facilities will be used to provide supplemental water to 6,714 acres on the west side of the Beaverhead valley north of Dillon. The point of diversion is located about 2 miles downstream from Apex Dam site.

Fish

Birch Creek now has its flows severely depleted by private irrigation interests in the 8-mile reach above its confluence with the Big Hole River and there is no fishing. The stream above this reach offers limited fishing for cutthroat trout.

Apex Reservoir would support a small amount of fishing. This likely would be more than that in the 1 mile of Birch Creek to be inundated. The expected average annual fluctuation of 44 feet would be a limiting factor to both trout production and fisherman use.

With-the-unit releases from the reservoir would be diverted through existing diversion facilities about 2 miles downstream from the dam site. The rather limited fishing which exists in the 2-mile reach of stream between this point and the dam would incur losses due to curtailment of winter flows. The remaining 8 miles of Birch Creek below the diversion which now has no fishery would not be changed with the unit.

Wildlife

Elimination of moose and mule deer habitat found along the 1 mile of Birch Creek which would be inundated by Apex Reservoir would have little effect on these two species. Upland-game species would be affected only slightly by the minor reduction in habitat. Apex Reservoir is not expected to be attractive to waterfowl or aquatic fur animals. Furnishing additional water to the 6,714 acres in the West Bench Unit already under partial irrigation would not result in any material changes in wildlife habitat there and no significant changes in wildlife production or hunting is expected on these lands.

Whitehall and Jefferson Units

(Maps MO 1-9-12 & MO 1-9-13)

Plan of Development

The principal feature in the development of the Whitehall and Jefferson Units is the Reichle Dam and Reservoir, a multipurpose structure to store and regulate river flows for the benefit of irrigation, flood control, and fish and wildlife. Reichle Dam will be located on the Big Hole River about 15.5 miles upstream from Twin Bridges.

Storage allocations for Reichle Reservoir are shown in Table 7. Table 8 is of reservoir operation data.

Table 7. Reichle Reservoir Storage Allocations

Storage Purpose	Storage (acre-ft.)
Fish and Wildlife	318,300
Flood Control	170,000
Conservation	297,000
Dead and Inactive	53,000

Table 8. Reichle Reservoir Data

Item	Elevation (ft. m.s.l.)	Capacity (acre-ft.)	Surface Area (acres)
Maximum Pool	5044.5	838,300	10,900
Average Annual Maximum Pool	5022.0	613,330	9,060
Average Annual Minimum Pool	4983.0	325,560	5,670
Stream Bed	4818.0	0	0

During the course of planning for Reichle Reservoir, the Bureau of Sport Fisheries and Wildlife recommended that certain flows be maintained in the Big Hole River at Reichle Dam and in the Jefferson River immediately below the Jefferson Canal for the protection of fish. Further planning between the Bureau of Sport Fisheries and Wildlife and the Bureau of Reclamation resulted in adoption of a plan of operation for irrigation and flood control, as well as for fish, that in normal years will provide flows in excess of those originally recommended by the Bureau of Sport Fisheries and Wildlife. A slight shortage over recommended flows will prevail in critical years. A comparison of minimum flows recommended for fish and flows which will be provided both in normal and critical years at Reichle Dam and immediately below the Jefferson Canal are shown in Tables 9 and 10.

Table 9. Flows in Big Hole River below Reichle Dam

Month	Minimum flows necessary to maintain existing fishery 1/ (cfs)	Flows Provided Under Reclamation's Plan of Operation: In Critical Years (cfs)	Flows Provided Under Reclamation's Plan of Operation: In Normal Years (cfs)
October	300	270	540
November	300	270	540
December	300	270	540
January	300	270	540
February	300	270	540
March	300	270	540
April	550	490	870
May	800	720	1,210
June	800	720	1,210
July	670	600	1,210
August	420	380	1,010
September	300	270	670

1/ Preliminary estimates subject to change after more detailed studies.

Table 10. Flows in Jefferson River below Jefferson Canal

Month	Minimum flows necessary to maintain existing fishery 1/ (cfs)	Flows Provided Under Reclamation's Plan of Operation: In Critical Years (cfs)	Flows Provided Under Reclamation's Plan of Operation: In Normal Years (cfs)
October	590	520	920
November	590	520	920
December	590	520	920
January	590	520	920
February	590	520	920
March	670	600	1,090
April	840	750	1,260
May	840	750	1,260
June	840	750	1,260
July	760	680	1,010
August	670	600	920
September	670	600	920

1/ Preliminary estimates subject to change after more detailed studies.

If Reichle Reservoir fills by the end of July, normal-year flows will be maintained August through February below both Reichle Dam and the Jefferson Canal. If Reichle Reservoir does not fill by the end of July, critical-year flows will be maintained August through February. If the March 1 forecast indicates that Reichle Reservoir will not fill, only those amounts necessary to maintain critical-year flow will be released during the period March through July.

Analysis of the 31-year period of study, which includes the extended drought period of the 1930's, indicated that normal-year flows could be maintained 67 percent of the years of study. Further analysis indicated that if the period of study were extended to 50 years or more, normal-year flows could be maintained 80 percent of the time.

The Whitehall Diversion Dam will be located on the Big Hole River about 9 miles downstream from Reichle Dam. The Whitehall Canal, with a capacity of approximately 150 c.f.s., will divert from the west side of the river and extend about 67 miles to its terminus at Whitehall. A full water supply will be furnished to 6,695 acres and 3,881 acres will be furnished a supplemental supply.

The Jefferson Diversion Dam will be located on the Jefferson River about 1 mile downstream from its confluence with the Big Hole River. The Jefferson Canal, with a diversion capacity of approximately 885 c.f.s., will be 60 miles in length. The canal will follow the east side of the river to provide a full water supply to 1,550 acres of the Upper Jefferson area between Twin Bridges and Whitehall. It will continue on to provide a full supply to 2,080 acres in the Lower Jefferson Area, and a supplemented supply to 792 acres in the South Boulder Area. At a point about 5 miles below Jefferson Island the canal will go through a siphon under the Jefferson River and continue northward to its terminus in Milligan Reservoir. Provision has been made for construction of a fish excluder at the head of both the Whitehall and Jefferson canals.

Milligan Reservoir, a regulatory-storage facility, will be located on Milligan Creek, an intermittent tributary of the Jefferson River, about 6 miles west of the town of Three Forks. Since there is little natural flow in Milligan Creek, virtually all the water stored in this reservoir will be supplied from the Jefferson Canal.

Although present plans call for a low-level outlet, practically all discharge from Milligan Reservoir will be through a canal-outlet works and tunnel on the north side into the Townsend-Valley View Canals. The channel downstream from the stream-outlet works is quite limited in capacity, and releases great enough to empty dead and inactive storage (Table 11) probably would result in damaging flows, particularly at the highway and railway crossings.

Table 11. Milligan Reservoir Storage Allocations

Storage Purpose	Storage (acre-ft.)
Conservation	35,000
Dead and Inactive	16,310

Operational data for Milligan Reservoir are shown in Table 12.

Table 12. Milligan Reservoir Data

Item	Elevation (ft. m.s.l.)	Capacity (acre-ft.)	Surface Area (acres)
Maximum Pool	4500	51,310	1,046
Average Annual Maximum Pool	4500	51,310	1,046
Average Annual Minimum Pool	4460	19,210	575
Stream Bed	4345	---	---

A water supply to irrigable lands to the north of Milligan Reservoir will be furnished through the Valley View, Townsend, and Crow Creek Canals. The Townsend Canal will be about 80 miles in length and the Crow Creek Canal will be about 20 miles long. The Valley View Canal will take off from the Townsend Canal and will be used to provide a full water supply to 2,355 acres and a supplemental supply to 195 acres of land in the Valley View Area on the bench northwest of Three Forks. The Townsend Canal also will take off from Milligan Reservoir. The present distribution system of the Crow Creek Pump Unit [10] will be supplied by the Townsend Canal which will provide a full water supply to 5,020 acres of new lands. Branching from the Townsend Canal, the Crow Creek Canal will serve an additional 15,040 acres with a full water supply and 7,773 acres with a supplemental water supply in the Crow Creek Area. The Townsend Canal will cross the Missouri River by siphon just above Toston and will continue over 40 miles northward along the east side of the valley to provide a full water supply to 21,365 acres and a supplemental supply to 6,430 acres of lands in the Townsend Area. The canal will terminate at Hellgate Gulch, not far above Canyon Ferry Dam.

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[10] An analysis of the Crow Creek Unit, now called the Crow Creek Pump Unit, under the Jefferson Unit, and its effect on fish and wildlife resources is contained in: A preliminary evaluation report on fish and wildlife resources in relation to the water development plan for the Crow Creek Unit, Montana, dated October 1949, and a letter of amendment dated April 14, 1952.

Fish

Construction and operation of Reichle Reservoir would affect fish resources over 24.2 miles of the Big Hole River and 65 miles of the Jefferson River. Construction of Milligan Reservoir would result in a fishery where none now exists.

As has been pointed out elsewhere in this report, the Big Hole River (Fig. 10) is highly productive of trout and offers some extremely valuable fishing. The river is noted for its rainbow and brown trout, some of which attain weights of 4, 5, or more pounds. The Jefferson River may not now be fished as much as some other rivers in the Three Forks Division, but it is known to be productive of rainbow and brown trout and fishing can be expected to increase in the future. Both the Big Hole and the Jefferson, but especially the Jefferson, are known for their winter fishing for Rocky Mountain whitefish.

At the average annual maximum pool, Reichle Reservoir would be 9,060 surface acres in size and would inundate 11.1 miles of the Big Hole River, 1.7 miles of Willow Creek, and 1.3 miles of Birch Creek. There is no fishing in those portions of Willow Creek and Birch Creek which would be inundated; however, the 11.1 miles of the Big Hole River to be inundated are very productive and development of the unit would result in loss of some very valuable fishing water. Under planned operation Reichle Reservoir would fluctuate about 39 feet annually. This would not be conducive to fish production, and the exposure of barren shorelines during summer drawdown would not be conducive to fisherman use, in spite of good access via U. S. Highway 91. Conditions would be favorable for carp and suckers and these undesirable species would likely be a major problem to fishery management. For these reasons the reservoir fishery is not expected to be as valuable as the stream fishery it would replace.

Planned releases to the Big Hole River below Reichle Dam as shown in Table 9 (page 42) are expected to result in material benefits to the fish in this 15.5-mile reach of river. This is based on (1) the expectation that normal-year flows would occur about 80 percent of the time, (2) the near approach to the minimum flows required to maintain the existing fishery during the other 20 percent of the time, and (3) the relatively greater stabilization of daily and weekly flows expected in comparison to the extreme fluctuations which have prevailed under

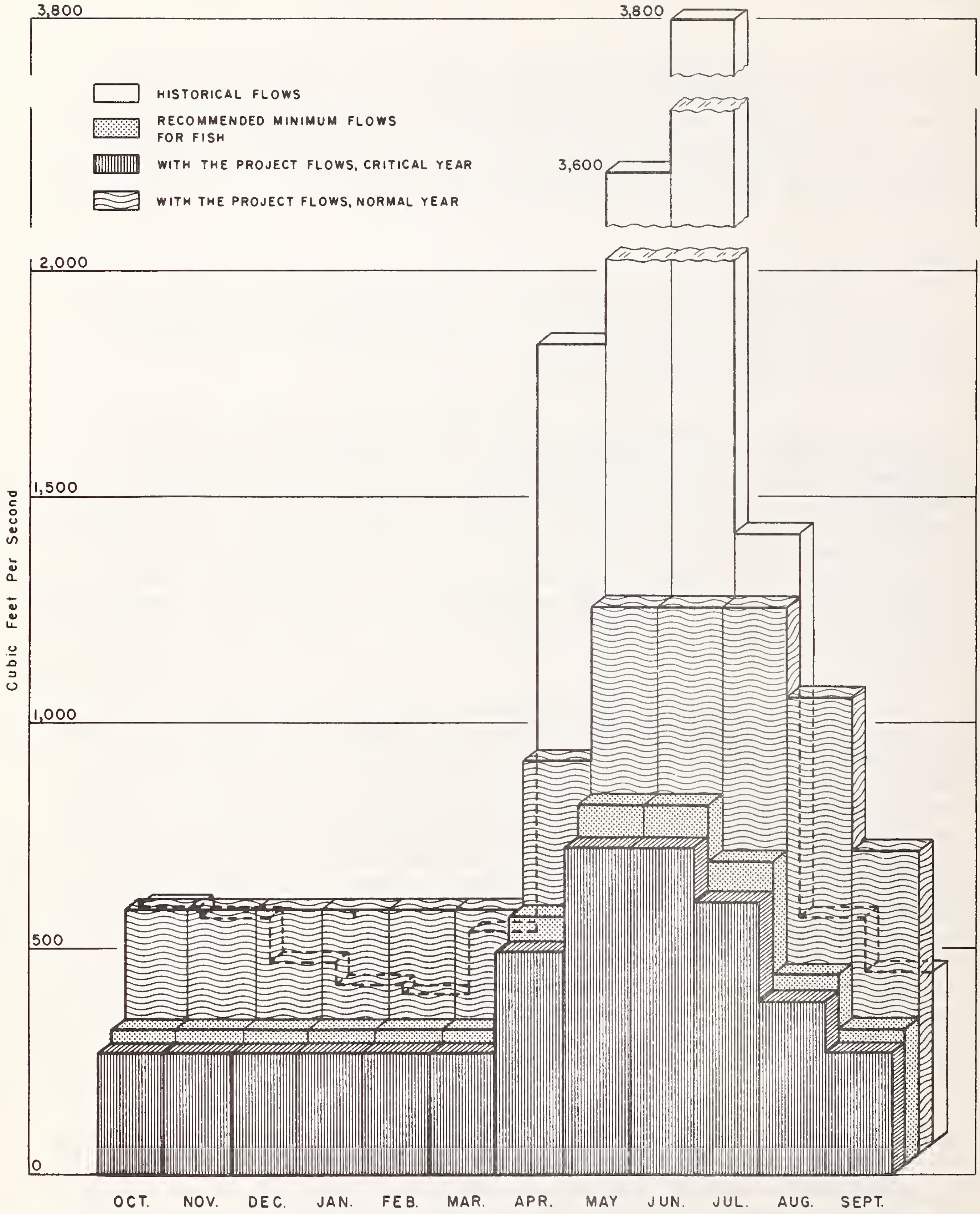

CHART I. Comparison of Flows in Big Hole River below Reichle Dam historic conditions. The relationship between normal and critical-year flows, minimum flows required for fish, and historical flows for the Big Hole River below Reichle Dam are compared in Chart 1.

Planned flows in the Jefferson River below the Jefferson Canal are expected to result in benefits to the fishery in this 65 mile reach of river too, for the same reasons as enumerated in the case of the Big Hole River. The planned flows for this stream together with the minimum flow recommended by the Bureau of Sport Fisheries and Wildlife are shown in Table 10 (page 42). These are compared with historical flows in Chart 2.

In spite of an average annual fluctuation of about 40 feet, it is expected that good trout fishing could be developed in Milligan Reservoir. Milligan Gulch, where the reservoir would be built, is an intermittent stream and has no fishery now. The expectation for good fishing arises in part from provision of a low-level outlet which would permit drawdown to a point where complete rehabilitation could be carried out as needed. Also, fall filling is planned, which would permit maintenance of a stable level in winter. Good winter fishing should prevail under these conditions. Milligan Gulch is steep-sided and therefore there would be few unsightly mud flats to detract from the reservoir's use as it is drawn down. U. S. Highway 10S would pass close to the reservoir making it readily accessible to a fairly large segment of the Three Forks area population.

The Montana Fish and Game Commission early had reservations on the beneficial effect of the planned operation of Reichle Reservoir on the fishery of the Big Hole River below Reichle Dam as outlined above. However, with further review of the factors involved, they have concluded that the operation of the reservoir could be worked out during later planning so as not to affect the fishery adversely.

Wildlife

Both mule deer and white-tailed deer are found along the river in the Reichle Reservoir site. The Big Hole River and the numerous oxbows and sloughs within the site also provide habitat for beavers, minks, muskrats, otters, and other fur animals. A few ducks nest on the sloughs and oxbows. Inundation of the various habitats in the reservoir area would result in loss to animals occupying those habitats.

Impoundment of Reichle Reservoir would make a better balanced waterfowl habitat in the Big Hole Valley. Ducks and geese would find a safe resting place on the reservoir during the hunting season. Although this might be true, they are expected to remain in the area throughout the hunting season and thus provide more hunting opportunities. Wheat produced along the Beaverhead and Jefferson Rivers downstream from Reichle Reservoir would provide the necessary food for any waterfowl

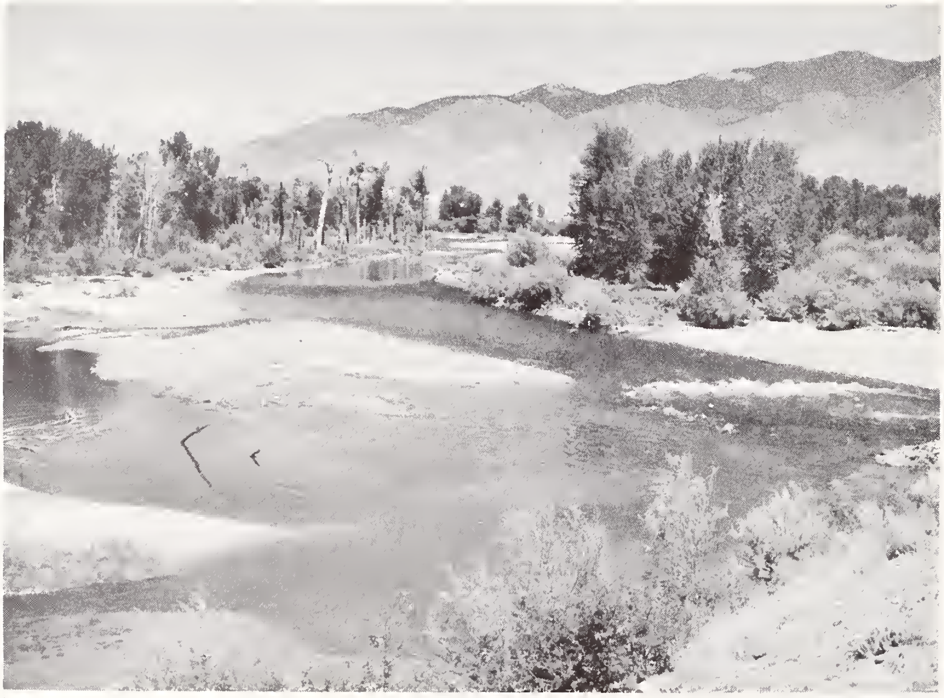

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Fig. 10. The Big Hole River within the Reichle Reservoir site has an interspersion of pools and riffles that is very productive of fish, and inundation would result in a considerable loss to fishing. The densely wooded bottom provides excellent habitat for deer while the numerous oxbows provide habitat for aquatic fur animals.

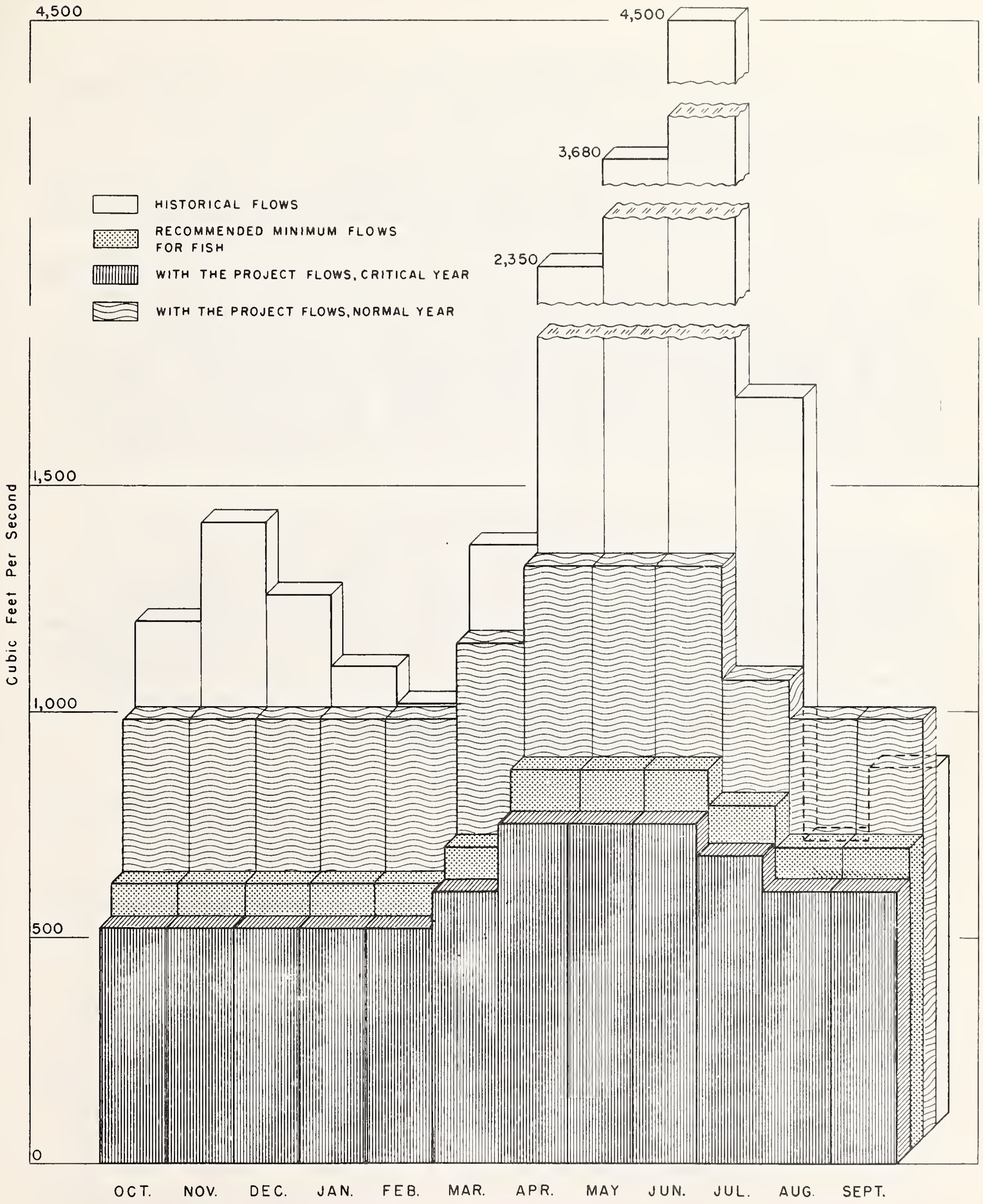


CHART 2. Comparison of Flows in Jefferson River below Jefferson Canal

using the reservoir. Nongame species such as pelicans, cormorants, and various water and shore birds would be attracted to Reichle Reservoir. Trumpeter swans may find the area suitable for their needs at least for part of the year.

A full supply of water would be provided to 55,090 acres extending from the town of Twin Bridges to Canyon Ferry Reservoir. Most of this land is now used for growing dry-land wheat and for grazing livestock and present wildlife values are minor. Following irrigation, there would be a more varied type of habitat which would be especially attractive to pheasants. Fur animals and waterfowl would benefit from the seeps and drains which would result from irrigation. The Crow Creek 11/ and Townsend Areas, having a total of about 36,000 irrigable acres in a fairly solid block would be highly productive of pheasants. Being in fairly close proximity to the cities of Butte and Helena, these areas are expected to absorb a considerable amount of hunting pressure.

Although mule deer, sage grouse, and chukar partridges use the Milligan Reservoir site, the amount of habitat which would be inundated by the reservoir (1,046 acres) is of negiligible value in maintaining local populations of these animals. According to operation studies, Milligan Reservoir would be filled during the fall which would make it an excellent resting area for waterfowl. The proximity of the reservoir to grainfields would add to its attractiveness to waterfowl. Because of the severe annual drawdown, 44 feet, Milligan Reservoir is not expected to be of much value to aquatic fur animals.

Clarkston Unit
(Map MO 1-9-13)

Plan of Development

The principal features of the Clarkston Unit would be a pumping plant on the right bank of the Missouri River at Clarkston, an 8.5-mile main canal, a small lateral system, and drains. The total annual water requirements for the unit would be 2,760 acre-feet for a full water supply to 985 acres. Approximately 1,170 acre-feet would be returned to the river via return flow and wastage, leaving a net annual depletion in the Missouri River of 1,590 acre-feet. The pump capacity would be 23 c.f.s., and the design of the canal also would be 23 c.f.s. Power for pumping would be obtained from the Montana Power Company's system at Trident.

11/ See footnote 10, page 44.

Fish

Development and operation of this small pumping unit would not appreciably affect fishing in the adjacent Missouri River. Removal of a maximum of 23 c.f.s. of water from the river at a point where flows usually exceed 5,000 c.f.s. would not be important.

Wildlife

Conversion of 985 acres in the Clarkston Unit from dry-grazing land to irrigated land, would have a very limited effect on wildlife in the area. The few mule deer probably would move from the area after irrigation. More pheasant habitat would be produced and more pheasant hunting would result. The populations and take of other wildlife would be relatively unchanged.

MADISON SUB-BASIN

Water development in the Madison Sub-basin would include purchase of 40,000 acre-feet of storage in the existing Hebgen Reservoir, an 18,000-kilowatt power development at Lyon Power Plant, and two irrigation diversion (Map MO 1-9-14). A total of 33,420 acres would be irrigated.

Lyon, Cameron Bench, and Madison Units
(Map MO 1-9-14)

Plan of Development

The latest plan for development of the Madison River provides for the use of 40,000 acre-feet of Hebgen Reservoir space for regulation of releases for fish. Operation of Hebgen Reservoir will deviate only slightly from the historical operation under this plan (Table 13).

Table 13. Hebgen Reservoir Data

Item	Elevation (ft. m.s.l.)	Storage (acre-ft.)	Surface Area (acres)
Maximum Pool			
Historical	6544.1	345,125	13,680
Proposed	6544.1	345,125	13,680
Average Annual Maximum Pool			
Historical	6542.9	329,530	13,380
Proposed	6541.7	312,240	13,050
Average Annual Minimum Pool			
Historical	6528.7	170,520	8,750
Proposed	6526.7	154,220	8,130
Stream Bed	6482.1	---	---

BASE: USBR DRWG. NO. 613-604-605

With development Hebgen Reservoir will still be operated in compliance with the Federal Power Commission license of April 23, 1956, to the Montana Power Company for the Missouri-Madison Project (No. 2188). Articles 28 and 29 of that license which relate to recreation and fish and wildlife are quoted:

> "Article 28. For the purpose of preserving recreational values, the Licensee shall endeavor to limit the drawdown of the Hebgen Reservoir to an elevation not less than 6,540 feet during the period June 1 to October 1 each year: Provided, that in case of emergency or as necessitated by stream flow conditions the reservoir may be maintained at such lower elevations as may be prescribed by the Commission upon recommendation of the Forest Service."

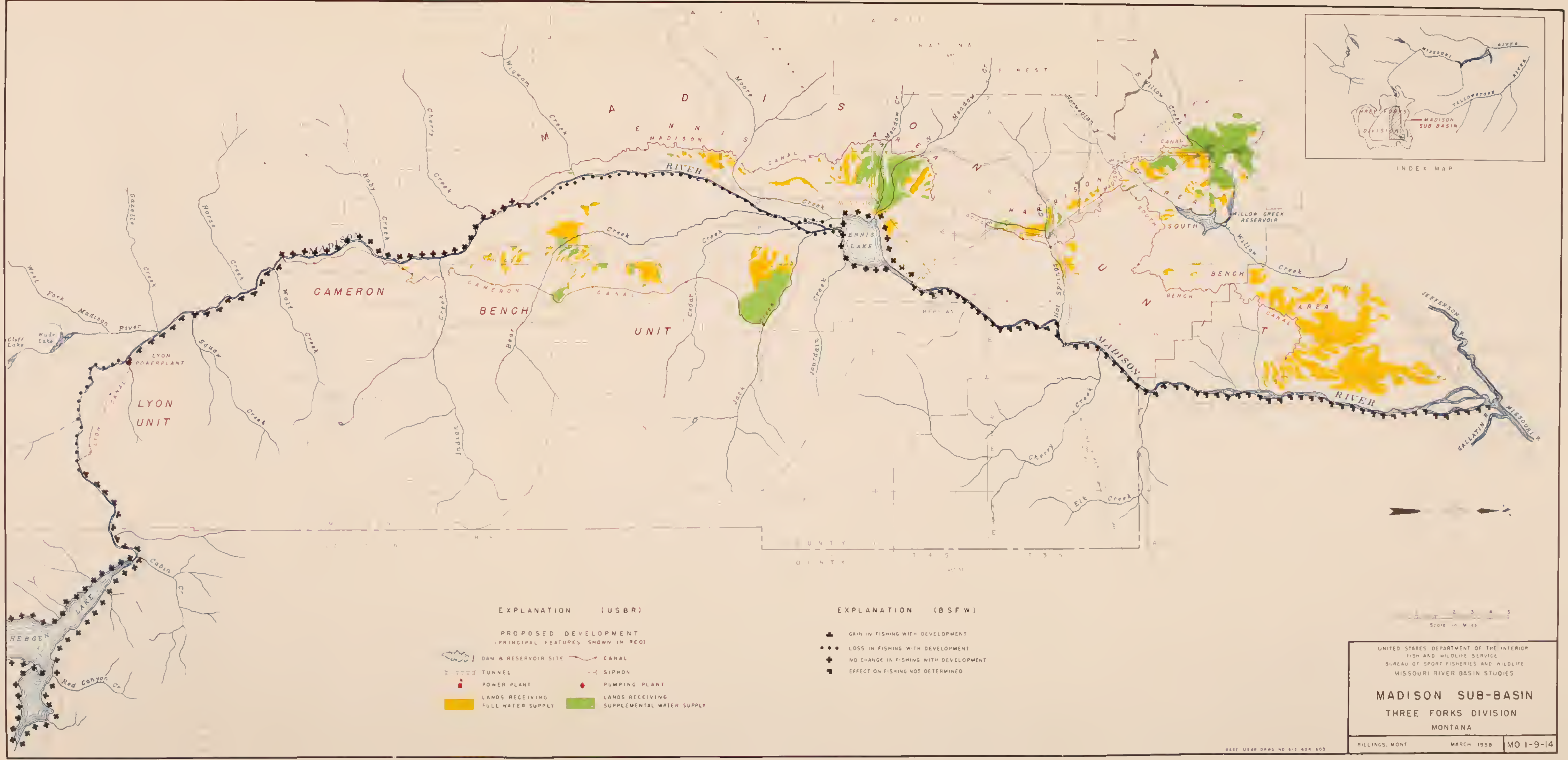
> "Article 29. The Licensee shall comply with such reasonable modifications of project operation in the interest of fish and wildlife conservation as may be prescribed hereafter by the Commission upon the recommendation of the Secretary of the Interior and the Montana Department of Fish and Game."

Year-round releases from Hebgen Reservoir will be essentially as under previous conditions. However, during the irrigation season there will be greater daily-flow stabilization than under historical conditions.

The Lyon Power Diversion Dam will be located about 7 miles below Hebgen Reservoir and the Lyon Power Plant will be located a distance of 6.5 miles from the Lyon Diversion Dam. A minimum flow of 200 c.f.s. will be maintained for fish in the river channel below the point of diversion. Any flows in excess of the capacity of the power canal also will go down the river. The capacity of the power canal will be 885 c.f.s. Diverted water will be returned to the river through Lyon Powerplant, a run-of-the-river plant having an energy output of 18,000 kilowatts.

The diversion dam for the Cameron Bench Unit will be located a short distance below Wolf Creek. Cameron Canal, with a maximum capacity of 150 c.f.s. and a length of 30 miles, will have its terminus in Jack Creek northeast of Ennis. The canal will carry a full water supply to 4,030 acres and a supplemental supply to 3,140 acres.

The diversion dam for the Madison Unit will be located about 13 miles downstream from the Cameron Diversion Dam. The Madison Canal, with an initial capacity of 525 second-feet, will divert from the west side of the river. The first land to be served will be in the Ennis Area where 5,230 acres will be provided a supplemental water supply. These tracts will be located along the canal between Varney and McAllister. The canal will be tunneled through the hill between McAllister and Norris to provide water for the Harrison and South Bench areas. In the Harrison Area 8,420 acres will receive a supplemental



UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
MISSOURI RIVER BASIN STUDIES

MADISON SUB-BASIN
THREE FORKS DIVISION
MONTANA

BILLINGS, MONT MARCH 1958 MO 1-9-14

GPO 856903

supply of water. The Madison Canal will terminate in Willow Creek, a tributary of the Jefferson River. About midway between Norris and Harrison, the South Bench Canal will take off from the Madison Canal and carry a full water supply to 12,600 acres in the South Bench Area.

Fish

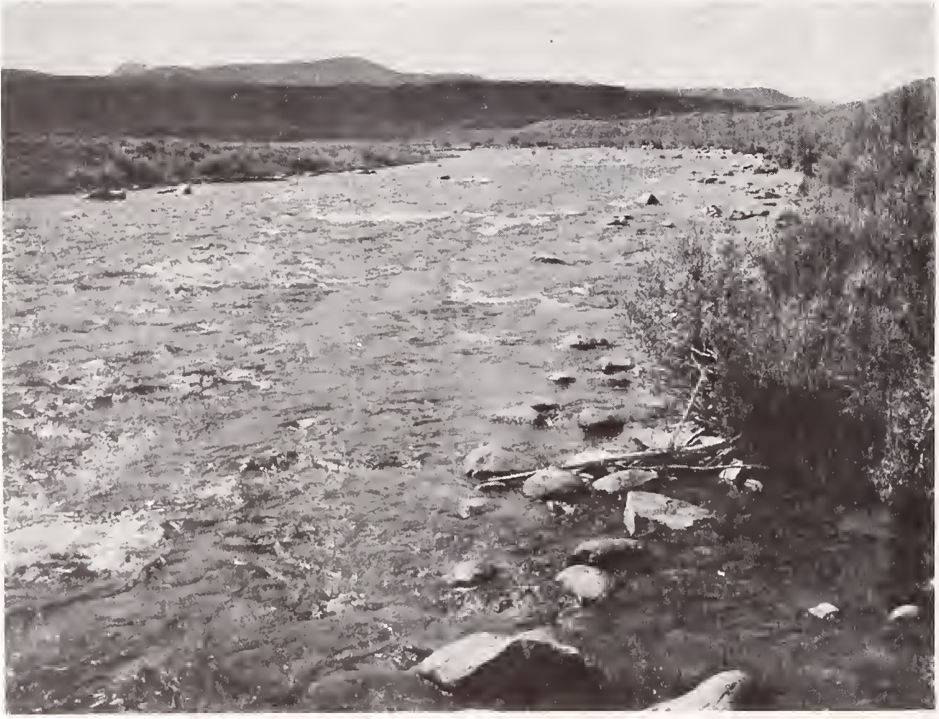
The only difference in operation of Hebgen Reservoir under the suggested plan as opposed to historical operation would be an 0.8 foot greater average annual fluctuation in level. This would have no appreciable effect on the fishery of the reservoir.

Except for a greater daily flow stabilization, releases to the Madison River at Hebgen Dam would remain virtually unchanged with development. The more satisfactory flow condition resulting from the greater daily-flow stabilization would prevail in the 7-mile reach of the river from Hebgen Dam to the proposed Lyon Canal, and small benefits would occur to the fishery.

Flows in the 6.5-mile reach of river (Fig. 11) bypassed between the Lyon Diversion Dam and Lyon Powerplant return would be curtailed, usually to 200 c.f.s., the minimum to be provided for fish. Historically, mean monthly flows in this reach were above 500 c.f.s. The reduction to 200 c.f.s. would result in a severe reduction in fish habitat and production. The river would no longer fill its normal channel and much of the fish food producing area of rock and rubble bottom would be permanently dewatered and the shelter of deep riffles and occasional pools would be severely limited. Plans call for installation of a fish excluder device at the point of diversion to the Lyons Power Plant; therefore, the 6.5 miles of canal leading to the plant would not contain fish.

All upstream diversion would be returned to the river below the Lyon Powerplant. Like the 7-mile reach below Hebgen Dam, the 12 miles of river from the power plant downstream to Cameron Bench Canal would have flows similar in quantity to historical ones but with greater stabilization. This reach then would be slightly better with the units than without.

The Cameron Bench Canal would be located just below the mouth of Wolf Creek. Diversion would vary from about 25 c.f.s. during May and September to a maximum of about 100 c.f.s. during the summer period. The diversion of 25 c.f.s. in May or September when flows in the river at this point normally are about 1,000 c.f.s. and the diversion of 50 to 100 c.f.s. in June, July, and August when river flows ordinarily are between 1,300 to 2,000 c.f.s. would affect fishing to the extent that any benefits which might result from improved control of upstream releases would be cancelled out. No flow depletions would occur from October through April. It is expected that fishing in the 13-mile



MRBS 5112

Fig. 11. The Madison River within the Lyons Power Plant Diversion area. Cutting of the flows from the approximate 500 cfs shown to as little as 200 cfs is expected to result in a serious loss to fishing. Fortunately only 6.5 miles of the Madison would be as adversely affected.

reach of river extending from the Cameron Diversion Dam downstream to the Madison Diversion Dam would not be changed appreciably by the development of the Madison River.

Diversion of a maximum of 525 c.f.s. at the Madison Diversion Dam would affect seriously the fish-production capacity of the river for some distance below this point. This fact was considered during the early stages of planning for the Three Forks Division, and as a result the Bureau of Sport Fisheries and Wildlife furnished the Bureau of Reclamation flow criteria which were considered the minimum that would permit the maintenance of existing fish values. Recommended flows below the Madison Diversion Dam were as follows: October through May, 840 c.f.s.; June, 1,175 c.f.s.; and July through September, 1,010 c.f.s.

These recommended flows were based upon a study of historical records. They are somewhat below the historical average monthly flows, based on the belief that the existing fishery could be maintained with an over-all reduction in flows provided that the lower flows were never permitted to go below the established minimum.

The Bureau of Reclamation developed an operation study entailing purchase of 40,000 acre-feet of storage in Hebgen Reservoir which was intended to meet the above minimum flow requirements. Analysis of this operation study indicates that it would not fully meet the requirements. The studies showed that the minimum-flow criteria were not met 10 percent of the time during the irrigation season, May through September, and 32 percent of the time during the nonirrigation season, October through April. Under these conditions, material losses to fish production and fishing would be incurred in the section of river between the Madison Diversion Dam and Ennis Lake.

Inflow to Ennis Lake would be reduced during the irrigation season by the amount of the diversion at the Cameron Bench and Madison Diversion Dams. This is not expected, however, to affect appreciably either the levels in the reservoir or releases from the reservoir which would continue to be operated by the Montana Power Company. Although releases from Ennis Lake are not expected to be changed to any great extent, irrigation return flows, siltation, and possible increase in water temperatures are some of the factors which could damage the fishery of the 39-mile reach of the Madison River extending downstream to its mouth. Studies will be made so that future reports will carry a more detailed analysis of the effects of the proposed development on fish in this lower reach of the Madison.

Terminus of the Madison Canal in Willow Creek may create problems relative to the Montana Fish and Game Department's annual spawn-taking operations in Willow Creek Reservoir. This aspect of development of Madison River waters has not been investigated; however, should it develop that this proves detrimental to the spawn-taking operation, consideration would have to be given to measures which would prevent the adverse effects. Willow Creek Reservoir is one of the few places where satisfactory spawn can readily be secured, and its maintenance for this purpose is extremely important.

Fish excluders are planned for installation at both the Cameron Bench and the Madison Diversion Dams.

Wildlife

Wildlife would not be affected to any significant degree at Hebgen Reservoir or along the river between Hebgen Dam and Ennis Lake due to changes in operation of Hebgen and releases to the river because of the project.

The Cameron Bench Unit, now mostly in native grass or irrigated hay, supports a few transient deer and sage grouse. A small herd of antelope moves around in the general area. Little, if any change in wildlife use of the area is expected with development. The area is too high in elevation to permit development of irrigated crops other than hay. Lack of diversification of crops as well as the altitude precludes development of much of a sizable pheasant population.

A total of 26,250 acres would be irrigated under the Madison Canal in the Madison Unit. Most of this land is now used for grazing sheep and cattle and for wheat farming. Small blocks of land scattered along the canal route from Ennis to Harrison in the Ennis and Harrison Areas would receive a supplemental water supply. The South Bench Area, a fairly large block of land, would receive a full water supply. Following irrigation, land use would change from a livestock grazing-dry land wheat economy to irrigated hay and pasture lands combined with row and grain crops.

Mule deer and antelope now use the irrigable lands. Hungarian partridges, mourning doves, and small flocks of sharp-tailed grouse find seasonal habitat on the grassland. Curlews are numerous. Diversified farming as practiced under irrigation would improve the irrigable areas for pheasants, minks, muskrats, and waterfowl. Seeps and marsh areas are expected to develop along the canals. Travel lanes and escape cover would develop along canals, ditches, fences, and roadways. The Cameron Bench and Madison Units would support additional quotas of upland game and waterfowl hunters, although most of the hunting pressure on the areas probably would be of local origin.

The Montana Fish and Game Department opposes developments in the Madison Sub-basin in line with the view of the Senate Joint Memorial No. 4 of the Thirty-Fifth Montana Legislative Assembly in which objection was raised to further development on the Madison River which could jeopardize its recreational value.

GALLATIN SUB-BASIN

The Gallatin Sub-basin includes the entire drainage basin of the Gallatin River as shown on the sub-basin map MO 1-9-15. Only one unit is included in the proposed plan.

Gallatin Unit
(Map MO 1-9-15)

Plan of Development

The Bureau of Reclamation has made several studies involving various plans and combinations of plans to serve lands in the Gallatin Valley as well as the extensive dry-farmed bench lands on either side of the valley. These studies have involved both ground-water pumping and surface-water storage. At the present time only ground-water pumping is considered to be economically feasible.

An extensive system of private ditches diverting water from both the Gallatin and East Gallatin Rivers serve the Gallatin Valley at the present time. There are 51,139 irrigable acres requiring supplemental service and 7,957 acres of intermittently irrigated land in the area. There is a large aquifer of considerable depth underlying the valley from which enough ground-water could be pumped to satisfy the supplemental water requirements of the unit.

The ground-water pumping plan currently considered feasible will serve 51,139 acres of supplemental service land and 7,957 acres of intermittently irrigated land. Operation studies indicated that there will be a depletion of about 20,000 acre-feet in the Gallatin River because of lowering of the ground-water table due to pumping.

Fish

Under present conditions, there are flow depletions in the Gallatin River due to irrigation diversions. These depletions which start at the Kleinschmidt Diversion, become increasingly severe downstream.

The proposed ground-water pumping is expected to result in some additional depletions in the flows of the Gallatin River due to lowering of the ground-water table. Flow depletions 3 miles above Shedd's Bridge would be 22 c.f.s. in July, 50 c.f.s. in August, and 37 c.f.s. in September, while just 2 miles below Shedd's Bridge depletions would be about double these amounts in the same months. Total depletions would approximate 20,000 acre-feet.

Under the pumping plan, wells would be established as far upstream as Gallatin Gateway but no effect on the fishery of the Gallatin would be expected above a point about 1 mile below Gallatin Gateway. From this point downstream there would be an adverse effect which would become increasingly severe until the maximum detrimental effect would be reached at about Shedd's Bridge. From this bridge downstream for a distance of about 6 miles there would be depletions in flow which would approximate the condition which already occurs under present irrigation practices in the reach of river that lies between the 6th and 12th mile below Shedd's Bridge. This latter reach is depleted to the extent that it is almost completely dewatered for 1 or 2 months nearly every year. Ground-water pumping would not have any appreciable effect on the fishery beyond the 12th mile below Shedd's Bridge.

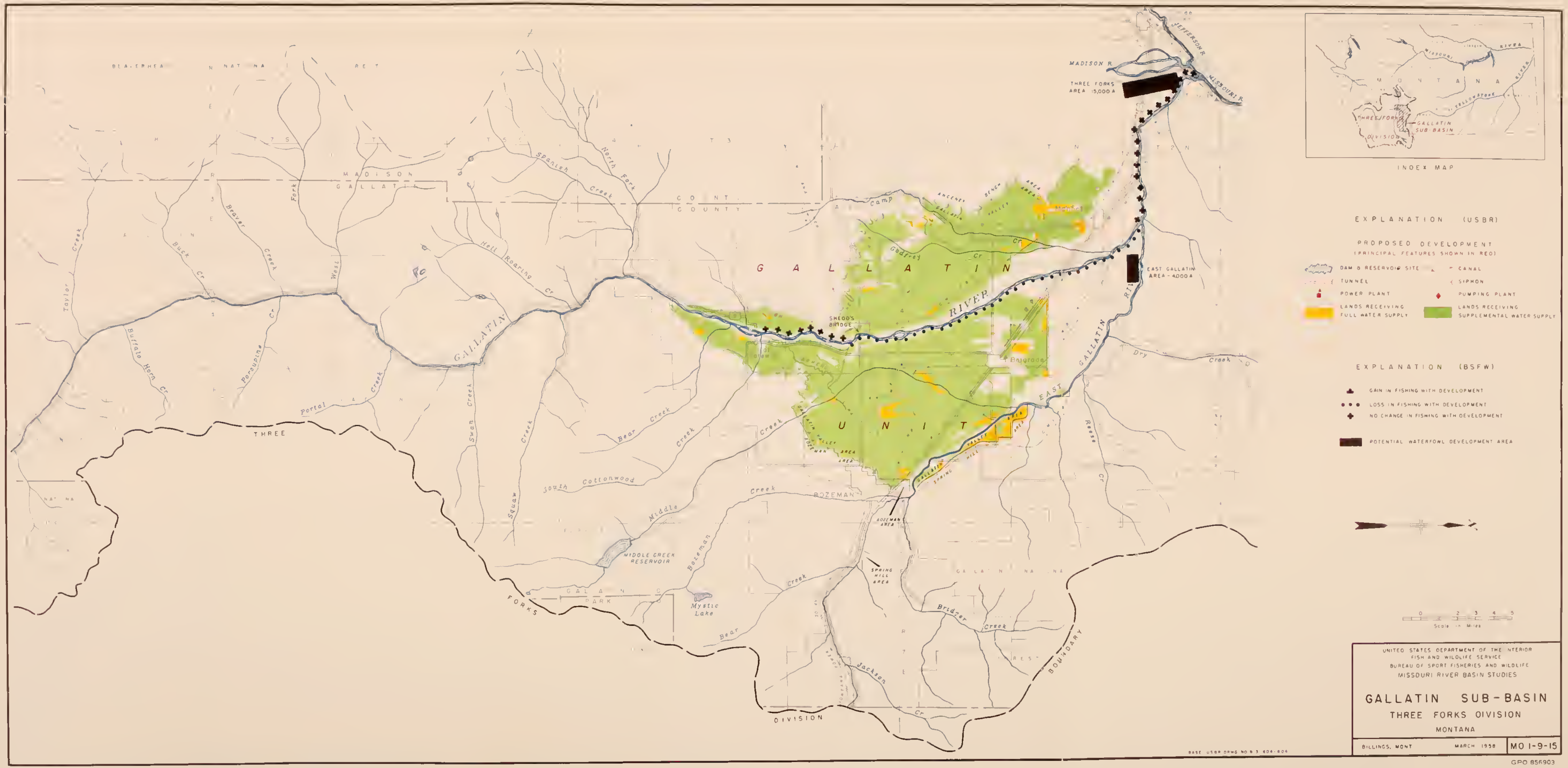
There are a number of small spring-fed creeks in the Gallatin Valley that have developed trout fisheries. The effect of ground-water pumping on these creeks is unknown but it is feared they would cease to flow with any lowering of the ground-water table.

No apparent means of preventing or mitigating the loss that would occur to fishing in the Gallatin River and small spring-fed streams in the Gallatin Valley under the ground-water pumping plan of development have been discovered to date. Further studies are needed to determine the feasibility of mitigation as well as the exact effects of pumping.

The East Gallatin River supports a rainbow fishery which is extensively used by local residents and is of considerable importance and value to these people. Return and waste flows from the supplemental irrigation of over 59,000 acres adjacent to the river could materially affect this river's productivity. These effects could be either detrimental or beneficial. Because the nature and extent of return and other flows into the East Gallatin cannot be determined until irrigation has been in progress for some time, solution of any of the above related problems must be deferred at this time.

Wildlife

Under present conditions, there is excellent habitat for pheasants, minks, muskrats, waterfowl, and many non-game species in the Gallatin Valley. Mule deer also occur in the area. Since the lands included in the Gallatin Unit are already irrigated, at least intermittently, wildlife habitat is stabilized around irrigation practices. Most of the farming centers on the irrigation of pastures and hay fields as well as small grain crops. Present farming conditions are not expected to change materially with development of the unit; consequently, no measurable change in wildlife habitat is anticipated as a result of providing supplemental water to the approximate 59,100 acres in the pumping unit. Opportunities for hunting and trapping would neither increase nor decline significantly with the unit.



UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
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MISSOURI RIVER BASIN STUDIES

GALLATIN SUB-BASIN
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MONTANA

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GPO 856903

Due to the limited investigations that have been made of the effects of the current plan of development on fish and wildlife resources of the Gallatin Valley, the Montana Fish and Game Commission reserves judgment on the plan until additional studies can be made.

Alternative Plans for Gallatin Unit

Alternative Plans of Development

Of the several alternate plans considered by the Bureau of Reclamation, two have been considered by the Bureau of Sport Fisheries and Wildlife. Both these alternatives would have required construction of a 260,000 acre-foot reservoir on the Gallatin River near the confluence of Spanish Creek and the Gallatin. This reservoir was to have been known as the Spanish Creek Reservoir.

One alternate plan would have provided 100,000 acre-feet of reservoir storage for maintenance of flows below the dam for fish. The remaining storage would have been used to serve lands in the valley and on the adjacent benchlands. Acreages to be served by gravity from the reservoir would have been 32,000 acres of full supply lands, 6,563 acres of intermittent supply lands, 26,825 acres of supplemental supply lands, and 4,436 acres of Class 6W land, which comprise the Anceney Bench Area, Bozeman Area, part of the Gallatin Valley Area, and the Spring Hill Area. The remainder of the Gallatin Valley Area, consisting of 51,139 acres of supplemental supply lands and 7,957 acres of intermittently irrigated land, would have been served by ground-water pumping.

Under the other alternative, gravity service from Spanish Creek Reservoir to the Springhill and Bozeman Areas, and part of the Gallatin Valley Area would have been provided. The remainder of the Gallatin Valley Area would have been served by ground-water pumping. Total acres in the unit would have been 11,045 acres of full service lands, 6,563 acres intermittently irrigated, and 26,825 acres of supplemental service lands in the gravity service area. Storage in Spanish Creek Reservoir which would have been allocated to the Anceney Bench Area in the previous alternative would have been used for fishery flows under this plan.

Fish

Under the first alternate plan, which would have provided for construction of Spanish Creek Reservoir, 7.3 miles of the Gallatin River and 3.1 miles of Spanish Creek would have been inundated. Rainbow and brown trout are prevalent in these two reaches of stream and provide fishing for many residents and nonresidents alike. Spanish Creek Reservoir, which would have covered 1,920 acres at the average annual maximum pool, would have been large enough to be attractive to many fishermen; however, it would have fluctuated 89 feet annually, which would not have been conducive either to fish production or to the development of an attractive fishing area. Constant drawdown after mid-June of each year to a low in September would have resulted in wide expanses of barren shoreline during most of the fishing season. On the other hand, the reservoir would have been readily accessible by highway, and the rock and rubble shoreline would have permitted boat launching at a number of points during most of the fishing season.

It was concluded that construction and operation of Spanish Creek Dam and Reservoir and the attendant replacement of 7.4 miles of valuable stream fishing with a less valuable reservoir fishery would have resulted in important losses to fishing.

Early during planning for development of the Gallatin River the Bureau of Sport Fisheries and Wildlife provided the Bureau of Reclamation with flow criteria which, it was believed, would have maintained the existing fishery. These stipulated flows were the minimum instantaneous permissible. Flow criteria were furnished for two sections of the river, (1) the reach between Spanish Creek Dam and the Shedd's Bridge and (2) the reach between the Shedd's Bridge and the confluence of the Gallatin and East Gallatin Rivers. Recommended flows for the first reach were: October through April, 300 c.f.s.; May through July, 500 c.f.s.; August, 400 c.f.s.; and September, 300 c.f.s. Recommended flows for the second reach were sustained flows of 170 c.f.s. the year round. Reclamation would have provided 100,000 acre-feet of storage in Spanish Creek Reservoir to provide these flows.

Analysis of the operation study for the Spanish Creek Reservoir indicated that the 12-mile reach of river between the dam and Shedd's Bridge would have experienced changes in flow pattern detrimental to the fishery following construction of the reservoir. Losses to the fishery would have been due mainly to reduction in winter flows from the 300 c.f.s. minimum flow considered necessary to maintenance of the existing fishery to a flow of about 180 to 200 c.f.s. during 55 percent of the time. Failure to meet minimum flow requirements in the irrigation season in the lower portion of this reach also would have been an important factor in causing losses to fish. Recommended minimum flows would not have been met 83 percent of the time immediately above Shedd's Bridge during the irrigation season.

The 20-mile reach of river extending from Shedd's Bridge to the confluence of the Gallatin and East Gallatin Rivers, although subject to change in historic flow patterns, would not have experienced any losses. Although the recommended flow of 170 c.f.s. would not have been met about 48 percent of the time during the irrigation season, flows well in excess of this minimum would have been maintained during the non-irrigation months. Also, the maintenance of a 170 c.f.s. flow during many years and not less than 100 c.f.s. during the dry years would have prevented complete dewatering of this reach such as had occurred many times during August and September in the past (Fig. 12). Annual dewatering of this reach has resulted historically in the loss of many pounds of fish. Reduction of annual high spring and early summer flows also might have been beneficial to fish. No appreciable change was expected in the fishery of the Gallatin River below its confluence with the East Gallatin.

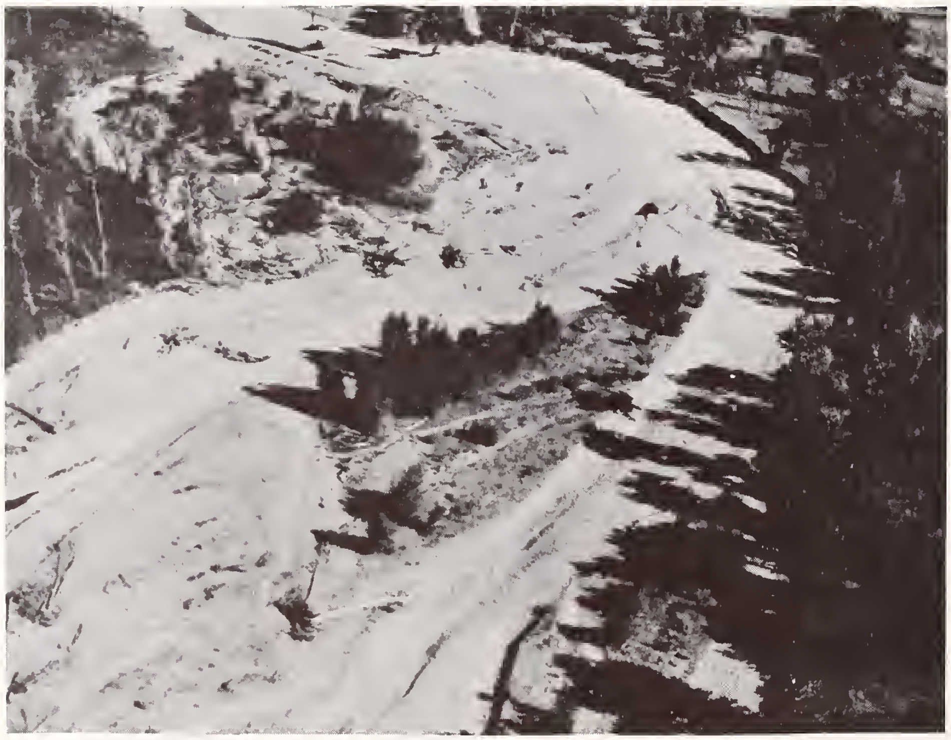
The second alternative would have excluded the Anceney Bench Area; however, it would have required construction of the 260,000 acre-foot Spanish Creek Reservoir. With the same size reservoir as in the first case, the stream miles inundated and a somewhat similar operation, it was concluded that the replacement of valuable stream fishing with a less valuable reservoir fishery would result in important losses to fishing.

Water which, in the previous alternative, would have been diverted to Anceney Bench lands now would have been available to increase the flows below the dam for fish. In the 12-mile reach between the dam site and Shedd's Bridge, proposed flows would have been somewhat greater than in the previous study but would still have failed to meet recommended minimums. During the non-irrigation months, minimum-flow requirements would have been met about 21 percent of the time; during the irrigation season, these would not have been met 70 percent of the time in the lower portion of the reach. Again, it was concluded that fishery losses, although not as severe as in the first alternate, would still have been substantial.

In the 20-mile reach of the Gallatin River between Shedd's Bridge and its confluence with the East Gallatin River, flows would have been below the recommended minimum of 170 c.f.s. about 24 percent of the time during the irrigation months. Flows in this reach would never have gone below 150 c.f.s., and most of the time flows would have been well in excess of the recommended minimum. During the non-irrigation months flows considerably greater than the 170 c.f.s. minimum would have prevailed; the lowest flows anticipated would have been greater than 220 c.f.s. It was concluded that this reach of river, which has been subjected to annual dewatering during the months of August and September many times in the past, would have been improved under the proposed operation of this alternate plan of development.

Wildlife

The two alternative proposals would have had a considerably different effect on wildlife than the pumping plan. Although Spanish Creek Reservoir would lie at the gateway to the upper Gallatin Canyon, where big-game resources attain national importance, construction of the reservoir would have had relatively little effect on these resources. The habitat of elk, bighorns, moose, or bears would have been encroached upon only to limited extent. Mule deer, however, would



MRBS 2152

Fig. 12. The Gallatin River below Shedd's Bridge on August 20, 1949, showing complete dewatering due to diversion of water for irrigation.

have been adversely affected. The several hundred deer which winter on the grass-covered slopes near the mouth of Spanish Creek would have been lost because substitute winter range would not have been available. A moderate amount of deer hunting occurs in the area, mostly by car hunters cruising along the road up Spanish Creek or on U. S. Highway 191 along the Gallatin River. The loss of winter range would reduce the number of deer and successful deer hunters.

Slight losses would have occurred to upland game through inundation of mountain-grouse habitat. Beavers and minks, now trapped within the reservoir site in lower Spanish Creek and the Gallatin River, would have suffered loss of habitat. The annual drawdown of 89 feet would have limited development of habitat suitable for the continued existence of fur animals in any numbers. Spanish Creek Reservoir would have been of little value for waterfowl because of its location in a narrow canyon off the main migration routes.

Under the first alternate a full supply of water would have been provided to 32,790 acres of land now dry farmed or used for grazing. Present wildlife use is limited to that by a few mule deer and antelope, and to waterfowl feeding in the wheat stubble during the fall and early winter. Pheasants are found occasionally on the dry-land wheat fields near irrigated areas.

Following irrigation, a variety of herbaceous and woody cover would have been expected to develop along canal and ditch banks and fence rows. Such cover, together with diversification of crops, would have resulted in good pheasant habitat similar to that on adjacent irrigated lands. A moderate amount of pheasant hunting would have been expected to develop. Minks, muskrats, and ducks would have been attracted to the drains and marshy areas resulting from irrigation. Deer and antelope now using the land to be irrigated would have been largely displaced.

Under the second alternative, the effect on wildlife in the irrigated area also would have been beneficial proportional to the amount of new land that would have been irrigated (11,045 acres).

The Montana Fish and Game Commission is opposed to the two plans which entailed construction of Spanish Creek Reservoir because of the serious adverse effects these would have on the fishery and big game resources of the upper Gallatin Valley.

THE THREE FORKS DIVISION
(Maps MO 1-9-12, MO 1-9-13, MO 1-9-14, & MO 1-9-15)

Fish

Fishing in two existing reservoirs and on about 318 miles of stream would be directly affected by developments in the Three Forks Division. Some of the effects would be beneficial, others would be detrimental, and still others would be neutral. These are summarized in Table 14.

Table 14. Fishing Waters Affected by Development in the Three Forks Division

Sub-basin, Unit, Stream or Reservoir	Area Affected (M-Miles; A-Acres)	Effect of Development		
		Improvement	Impairment	Neutral
Jefferson Sub-basin				
East Bench Unit				
Red Rock River	7.5 M		7.5 M	
Decker Pond Creek	2.0 M		2.0 M	
Horse Prairie Creek	8.6 M		8.6 M	
Beaverhead River	61.0 M	27.0 M	19.0 M	15.0 M
West Bench Unit				
Birch Creek	11.0 M	1.0 M	2.0 M	8.0 M
Whitehall & Jefferson Unit				
Bighole River	26.6 M	15.5 M	11.1 M	
Jefferson River	65.0 M	65.0 M		
Missouri River	3.5 M			3.5 M
Clarkston Unit				
Missouri River	39.9 M			39.9 M
Madison Sub-basin				
Lyon; Cameron Bench and Madison Units				
Hebgen Reservoir	13,380 A			13,380 A
Madison River	98.5 M 1/	19.0 M	27.5 M	13.0 M
Madison Reservoir	3,800 A			3,800 A
Gallatin Sub-basin				
Gallatin Unit				
Gallatin River	38.0 M		21.0 M	17.0 M

1/ Includes 39 miles of river below Madison Reservoir for which effect has not been determined.

Wildlife

In general, construction and operation of the several units in the Three Forks Division would effect wildlife only on lands to be inundated by reservoirs or to be newly irrigated. Lands already irrigated but to receive supplemental water are usually already modified sufficiently that the application of additional water would not materially affect either the wildlife habitat or the birds and mammals living there. Mountain goats, bighorns, moose, elk, bears, mountain grouse, and forest fur animals, such as the martin, would not be affected by development, either because they do not range into the affected area or the amount of habitat to be lost is so small that it is insignificant. Inundation at all the reservoir sites, the only affected areas of importance to the above listed animals, would amount to only about 6 square miles of habitat as compared to 8,000 to 10,000 square miles available.

Deer and antelope would be affected to a limited extent since these animals inhabit the river valleys and adjacent benchlands where the irrigable lands are located. Some fur animals, upland-game species such as pheasants and waterfowl which inhabit the valleys and foothills, would be affected significantly from conversion of native range to an irrigation economy. It can be expected that wildlife would be benefited. Those units where benefits would be significant are as follows: Jefferson Sub-basin, Jefferson and Whitehall Units and Reichle Reservoir; and Madison Sub-basin, Madison Unit, South Bench Area (Fig. 13).

MRBS 4436

Fig. 13. Irrigation of now dry land would result in a more varied type of habitat especially attractive to pheasants. One measure of the wildlife benefits is in the width of the smile when one of these superb game birds is taken to the bag.

FISH AND WILDLIFE PLANNING

Many provisions for the protection and development of fish and wildlife resources already have been included in the Three Forks Division plan. Specific facilities were incorporated as planning progressed. These include provision of storage in Reichle and Hebgen Reservoirs for maintenance of flows for fish in the river below each reservoir; provision of a low-level outlet in Milligan Reservoir to permit periodic rehabilitation of the fishery, and inclusion of fish excluders at the various points of diversion in each river system.

Several operation studies entailing releases to and flows in the various streams affected by the proposed developments were analyzed during the planning period. For instance, operation of Clark Canyon Reservoir as originally planned would have entailed flow depletions in the Beaverhead River between Clark Canyon Dam and the mouth of the Ruby River that would have seriously curtailed fish production and fishing. However, as a result of cooperative planning, the Bureau of Reclamation has planned to provide instantaneous minimum releases of 200 c.f.s. at Clark Canyon Dam and 250 c.f.s. at Barratts Diversion Dam except during periods of extended drought. With these flows fish production is expected to be nearly comparable to that under existing conditions.

Initial plans for irrigation development on the Big Hole and Jefferson Rivers also involved flow depletions which would have been detrimental to fishing. The Bureau of Sport Fisheries and Wildlife developed minimum flow criteria to: (1) maintain the existing fishery, and (2) improve the existing fishery. These were used in deriving a revised plan for the Whitehall and Jefferson Units. This revised plan included additional storage in the amount of 318,300 acre-feet in Reichle Reservoir to assure flows in the Big Hole River below Reichle Dam and in the Jefferson River below the Jefferson Diversion Dam which would materially benefit fish and fishing in the approximate 78 miles in the two reaches of stream. The flows are such as to increase and stabilize winter flows, reduce flood flows in the spring, and increase the summer and early fall flows.

An operation study for the Madison River which entailed purchase of 40,000 acre-feet of the Hebgen storage was examined. This operation would result in a reduction of winter flows in one section of river below those believed necessary for sustaining current fish production. This reduction together with diversion of up to 800 c.f.s. from 6.5 miles of the river at the Lyon Powerplant Diversion, would result in a substantial loss to the fishery of the Madison River between Hebgen and Madison Reservoirs.

The East Bench Canal, East Bench Unit, is designed to divert as much as 440 c.f.s. from the Beaverhead River at Barratts Diversion

Dam. Observations following closure of diversion canals such as this have revealed losses of great numbers of game fish. It is considered by the Bureau of Sport Fisheries and Wildlife that as much as one-ninth of the production of the Beaverhead River between Clark Canyon Dam and Barratts Diversion might be lost into the East Bench Canal unless some excluder device is installed in its mouth.

Working together, the Bureau of Reclamation and the Bureau of Sport Fisheries and Wildlife have developed plans for installation on an experimental basis of a shallow weir-type excluder in the East Bench Canal. One of the important factors in installation of this particular design is the small amount of maintenance expected. Depending on results obtained at the East Bench Canal, this type excluder or some modification thereof may be installed at other points of diversion in the Three Forks Division. The other planned points of diversion are: the 150-c.f.s. Whitehall Canal on the Big Hole River, the 885-c.f.s. Jefferson Canal on the Jefferson River; the 885-c.f.s. Lyon Power Canal; the 150-c.f.s. Cameron Bench Canal and the 525-c.f.s. Madison Canal on the Madison. Although no details of design have been considered for any diversion other than the East Bench Canal, an estimated cost has been included in each instance for purposes of cost analysis.

Provision has been made for a low-level outlet in Milligan Reservoir which would permit drawdown to the extent that treating the remaining water to eliminate undesirable fishes would be practical. The opportunity for periodic rehabilitation of a reservoir fishery at minimal cost is one not frequently encountered. In this instance, it is believed that substantial benefits to fishing can be obtained over the years if undesirable fish are eliminated periodically. Carp are expected to keep reinfesting this reservoir from the Jefferson Canal.

Carp are present in limited numbers in the Beaverhead River above the Clark Canyon Dam site. It is anticipated that conditions would be suitable in the reservoir for these few seed fish to increase and flourish to the extent that after a few years, maintenance of a desirable trout population would be extremely difficult. Therefore, it has been recommended that all fish in the Beaverhead and its tributaries for a distance of about 50 miles above Clark Canyon Dam be eradicated at the time of closure of the dam. Benefits to be derived from this proposed program, including restocking with 2 to 3-inch rainbow trout over a 3-year period would compensate for approximately one-ninth of the loss to fishing occasioned by flooding 18 miles of good trout stream.

Consideration also is being given to the desirability of removing the fish in the Big Hole River for 30 miles above Reichle Dam site at the time of closure of the dam to eliminate carp and other undesirable fish. This would reduce the problem of uncontrollable competition in subsequent management and the period of high quality fishing would be extended. Studies on this aspect of planning for Reichle Reservoir have not reached a stage of decision at this time.

It has already been stated that waterfowl make considerable use of the Three Forks area. Not only do trumpeter swans, Canada geese, and various ducks nest in the area but a large number of waterfowl pass through it during migration. Since the Three Forks area is so important to waterfowl, the Bureau of Sport Fisheries and Wildlife has an interest in developing one or more refuge units in the area. The Montana Fish and Game Department also is interested in waterfowl-management development opportunities.

Several opportunities for this type of development in the Three Forks area seem apparent, some in connection with the water-resource planning for the Three Forks Division and some only indirectly related to that plan. Studies conducted to date have been very preliminary in nature. Selection of likely sites for waterfowl-management areas has been only tentative. Further studies will be conducted as detailed planning for the various units gets underway.

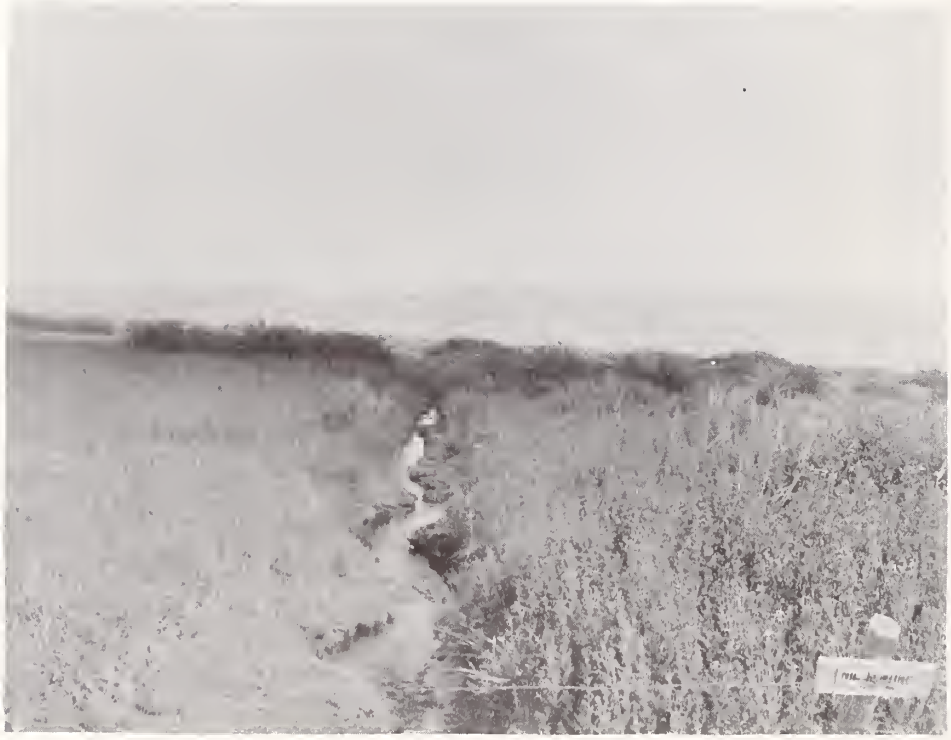
Sites which appear to offer opportunity for waterfowl development are (See Maps MO 1-9-12, MO 1-9-13, and MO 1-9-15):

1. East Bench Area. Development of 500-600 acres in a number of small areas along the Beaverhead River below the East Bench Canal appears possible. Water likely could be made available from deep drains servicing the East Bench Unit or from spring flows along the Beaverhead River.

2. Twin Bridges Area. 5,000-6,000 acres of bottomland lying between the Ruby and Beaverhead Rivers near the mouth of the Ruby. Water for development appears to be available from spring flows, mainly in the Ruby valley; however, it is possible that water could be obtained from the East Bench Unit by extending the East Bench Canal.

3. Whitehall Area. 1,000 acres in an existing, partly drained marsh in the Jefferson River valley near Whitehall. This area lies below irrigable lands in the Whitehall Unit. A water supply might be developed from irrigation return flows or a supply could be developed by diversion from the Whitehall Canal.

4. Lower Jefferson Area. 500-600 acres of oxbow and river-bottom marsh on both sides of the Jefferson River near the town of Willow Creek. A water supply could be developed by diversion of water from the Jefferson Canal on the north side of the river and by collection of return flows from the South Bench Area on the south side of the Jefferson.



MRBS 5115

Fig. 14. Irrigation return flows such as this one on the Crow Creek Area are a source of water with which waterfowl management areas could be developed. Developed areas properly managed would help to keep waterfowl in the vicinity longer than ordinary, and would increase the hunting opportunities.

5. Milligan Reservoir Area. 600 acres of marsh and water area in 2 or 3 pools could be developed above the maximum pool of Milligan Reservoir by pumping from the reservoir.

6. Three Forks Area. 12,000-15,000 acres of bottomland extending from the head of the Missouri near Three Forks, about 10 miles up the Madison and 3 miles up the Gallatin. Water likely could be obtained from spring flows in the area and existing irrigation water rights. This area has no direct connection with water-resource planning for the Three Forks Area. Nevertheless, because of its strategic location, size, and potentiality, it has high priority in Bureau considerations for waterfowl management.

7. East Gallatin Area. 4,000 acres of bottomland in the East Gallatin valley immediately above the confluence of the East Gallatin and Gallatin Rivers. Spring flows would be a source of water for the area. This area is not directly connected with proposed development in the Three Forks Area.

8. Crow Creek Area. 800 acres of partly drained marsh located between Toston and Radersburg. Water for development of this area could be obtained by direct diversion from the Crow Creek Canal or by collection of return flows from the Crow Creek Area (Fig. 14).

In addition to the above, there are a number of other areas in the Three Forks Division where return flows undoubtedly would collect. These areas are as yet unknown. They are expected to come to light during detailed studies. Detailed studies may demonstrate the feasibility of developing these areas as marshes for the enhancement of waterfowl and other wildlife instead of constructing deep drains and trying to reclaim them for agricultural purposes.

Fortunately, many of the streams and much of the game habitat in the Three Forks Division are now open to public fishing and hunting. Trends indicate, however, that in the future more control over public use of these resources on private lands is to be expected. Therefore, assignment of lands acquired for the project should be planned to provide for public use. Fish and wildlife have proven to be one of the greatest attractions around reservoirs and, undoubtedly, a major portion of the acquired lands would be dedicated to fish and wildlife purposes. To assure the fullest public enjoyment of the fish and wildlife resources of project areas, sufficient land must be acquired to provide for public access to the project areas. Too, wherever possible, access should be provided to canal and ditch rights-of-way for use by the sporting public.

Preliminary plans for the Three Forks Division contain little information on the amount of silt that may be picked up and carried into the streams of the Division via the waste water route. The adverse effects on fish resources of silt getting into the waters of the Division is of concern to the Montana Fish and Game Department and the Bureau of Sport Fisheries and Wildlife, and every consideration must be given to means and measures for prevention when detailed studies for the several units are made.

The purchase of additional storage at Hebgen Reservoir to provide flows in the Madison River which will meet minimum requirements to sustain at least the present fishery, should be considered during detailed planning for use of the Madison River water. Likewise, a means of providing flows to mitigate losses due to flow depletions in the Gallatin River and spring-fed streams in the Gallatin Valley must be considered during detailed planning.

Since perpetuation and development of the fish and wildlife resources of the Three Forks Division has been set forth as a purpose of the project, it is expected that every consideration will continue to be given fish and wildlife and that any future plan or combination of plans would afford at least the degree of protection and development now included in the preliminary plan.

The Montana Fish and Game Commission has indicated a belief that insufficient information was available to permit the appraisal of project plans and make the recommendations contained in the foregoing report. They recommend a number of investigations, designed to alleviate these inadequacies. The Bureau of Sport Fisheries and Wildlife is in concurrence with the need for additional studies prior to or at the time of detailed planning for individual units, and to that end is scheduling, in cooperation with the Fish and Game Department, such investigations as funds will permit.

RECOMMENDATIONS

To accomplish the objectives of planning for fish and wildlife and to achieve a continued integration of features for protection and development of fish and wildlife into the project plan, the following recommendations are made:

(1) Cooperative planning similar to that done previously between the Bureau of Sport Fisheries and Wildlife and the Bureau of Reclamation during the course of the present investigation be continued for each individual unit so that specific measures for fish and wildlife conservation can be included in the final plans.

(2) Land acquisition for reservoirs should include sufficient land, beyond the minimum needed for irrigation, power, and flood-control purposes, not only to permit the fullest enjoyment of fish and wildlife resources but to provide for public access to the project area.

(3) Access should be provided to canal and ditch rights-of-way for use by the sporting public wherein possible.

(4) Acquired land should be made available for wildlife conservation and management.

(5) Every consideration should be given to means and measures for prevention of the return to the stream of silt-laden waste waters which may be damaging to fish resources.

(6) Such reasonable modifications should be effected in structures and operations as may be recommended by the Montana Fish and Game Commission and the Bureau of Sport Fisheries and Wildlife after the project has been constructed.

MEASURE OF LOSSES AND BENEFITS

The cost of means and measures included as part of the Three Forks Division plan for the protection and development of fish and wildlife resources are set forth in Table 15.

Because of the unusual and outstanding quality of the fish and wildlife resources of the Three Forks area, and their use by residents of practically every state in the Nation, these resources are considered to be of national importance. The cost for their protection and development given in Table 15 are considered to be justified.

Table 15. Costs of Means and Measures for the Perpetuation and Enhancement of Fish and Wildlife Resources, Three Forks Division, Montana

Sub-basin, Unit, & Feature	Mitigation of Losses			Benefits		
	Measures for	Cost: Fish	Cost: Wildlife	Measures of	Cost: Fish	Cost: Wildlife
Jefferson Sub-basin						
East Bench Unit	Rehabilitation of 50 miles of stream above Clark Canyon Dam	$ 140,000 [1]		Capitalized annual values from East Bench Report [2]		$ 36,616
	Storage of 78,200 acre-feet in Clark Canyon Reservoir for downstream fish flows	904,000 [3]				
	Fish excluder, East Bench Canal	60,000 [3]				
West Bench Unit				Single purpose alternative	$ 44,000 [3]	
Whitehall & Jefferson Units	Storage of 318,300 acre-feet in Reichle Reservoir for downstream fish flows	1,400,000 [3]		Storage of 318,300 acre-feet in Reichle Reservoir for downstream fish flows	637,000 [3] [4]	
Reichle Reservoir				Single purpose alternative		40,000 [1]
Whitehall Unit	Fish excluder, Whitehall Canal	6,000 [3]		Single purpose alternative		40,000 [1]
Jefferson Unit	Fish excluder, Jefferson Canal	69,000 [3]				
Crow Creek Area				Single purpose alternative		350,000 [1]
Townsend Area				Single purpose alternative		270,000 [1]
Milligan Reservoir				Single purpose alternative	350,000 [3]	
Crow Creek Pump Unit				Capitalized annual values from Crow Creek Pumping Unit Report [2]		40,000 [1]
Madison Sub-basin						
Lyon, Cameron Bench & Madison Unit	40,000 acre-feet of storage in Hebgen Reservoir for downstream fish flows	400,000 [3]				
Lyon Unit	Fish excluder, Lyon Power Canal	65,000 [3]				
Cameron Bench Unit	Fish excluder, Cameron Bench Canal	6,000 [3]				
Madison Unit	Fish excluder, Madison Canal	76,000 [3]				
South Bench Area				Single purpose alternative		80,000 [1]
Gallatin Sub-basin						
Gallatin Unit [5]						

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[1] Cost estimate furnished by the Bureau of Sport Fisheries and Wildlife.

[2] Annual values as were furnished by the Fish and Wildlife Service in these instances are actually estimates of sportsmen's expenditures in the area of concern.

[3] Cost estimates made by the Bureau of Reclamation.

[4] The cost of providing 318,300 acre-feet of storage for downstream fish flows would be $2,037,000. However, 318,300 acre-feet of storage would provide flows which would make possible an improvement in the fishery. On the basis of the percentage of acre-feet in excess of that needed to restore the fishery, the measure of benefits would be $637,000.

[5] Losses to fish are expected to result from flow depletions in the Gallatin River due to ground-water pumping under the Gallatin Unit, but no means of preventing or mitigating these losses were found during the limited studies that were made of this latest plan of development.

VIEWS OF THE MONTANA FISH AND GAME COMMISSION

The Montana Fish and Game Commission reviewed a preliminary draft of the Bureau of Reclamation's proposed report on the Three Forks Division, dated September 1958. Their concern over the effects of the proposed developments on fish and wildlife resources of the area is tremendous. This concern was expressed in a statement dated October 14, 1958, which is herewith made a part of this report.

October 14, 1958

Report of the Montana Fish and Game Commission on the Preliminary Draft of the U. S. Bureau of Reclamation's "Three Forks Division Report" dated September 1958

The Montana Fish and Game Commission is not satisfied with the presentation made for fish and game with relation to the water development plan for the Three Forks Division. It therefore feels obligated to submit this report.

Montana is one of the last strongholds of important trout stream fishing in the nation, yet it has only 500 miles of "Blue Ribbon" trout streams; that is, streams of national importance. The area encompassed by the Three Forks Division contains far more of these waters than any similar sized area. In spite of serious inroads already made by irrigation developments the fisheries have survived; they are however, approaching the breaking point. If this valuable resource is to be maintained, it is imperative that no new development be permitted that would be detrimental to game fish in any of the "Blue Ribbon" streams. Unfortunately, the five best fishing streams in the area are the ones most affected by the present water development plans of the Bureau of Reclamation.

Also in view of the constantly dwindling game habitat of not only Montana, but the entire United States, it is felt that any additional reduction of game habitat must be carefully evaluated before the proposed developments are built.

The Montana Fish and Game Commission recognizes that water developments will be necessary to the continuing progress and development of the West. It feels, however, that when individual projects are presented to the people and the Congress for approval, the gains to irrigation, power and flood control must stand on their own merits and the losses to other resources including fish and wildlife must be clearly stated. Particularly must any benefits attributed to fish and wildlife be scrutinized since, on the basis of the past effects of irrigation impoundments on this resource, it would be ironical if unrealistic benefits to fish and wildlife were used to justify a major irrigation works on a nationally important trout stream.

General comments on the Bureau of Reclamation's report are as follows:

1. Since fish and wildlife is stated to be one of the purposes of the Bureau of Reclamation's water resource development plan for the Three Forks Division, there should be assurance that water allocated in streams and reservoirs for fish and game will not be usurped by illegal water users or be subsequently appropriated for industrial or other development. Unless such assurance is given in the Three Forks Development, fish and game will not be a partner in the development as stated.

2. It should be emphasized that the so-called "historical" flows mentioned in the report are not the flows existing when Lewis and Clark explored Montana. They reflect the depressed flows during the past 10 to 20 years that are influenced by the now existing irrigation developments. Rather than use the presently deteriorated streams as a goal, the aim should be for something comparable to what the rivers were capable of producing before the existing diversions. If fishery really is a project purpose then the most promising benefits from water developments would be strengthening the weak parts of the fishery resource rather than just meeting the bare minimum for maintaining the existing fishery.

3. Again, since one of the purposes of the development is fish and wildlife recreation, the importance of public access should be emphasized in the preliminary planning. This should include access not only on the project grounds, but also across private lands to recreation facilities provided by the project.

4. The report does not contain provisions to insure that irrigation waste waters will not carry silt back to the streams to the extent that this alone will ruin the remaining fishery. The need for such provisions is exemplified by silt-laden waste flows now existing in the Three Forks area. Return flows must comply with the State Pollution Laws.

5. The Commission appreciates the consideration given in project planning for flows below dams, minimum pools in

reservoirs for fish, and fish excluders in the mouths of irrigation canals. It feels, however, that throughout the report the alleged benefits to fish and wildlife to be derived from the projects are exaggerated and the monetary benefits to be derived by fish and wildlife from the projects are unrealistically high. The fishery is described as being enhanced or at least maintained at its present level in nearly every instance. For example, on page 59 the statement appears in describing the Madison River: "The effect on historical streamflow of the development described herein would be negligible." And on page 71: "In general, reservoirs on the streams will result in a loss in the portion of the stream inundated by the reservoir, but this will be largely offset by allocation of storage space to improve fishery below the reservoir..." However, based on the information available, it appears that due to reduced flows, silt-laden waste flows and changes in water temperatures, the stream fisheries in the area will be severely depressed by the projects. Likewise in the case of game, on page 72 there is the indication that "... irrigation will improve the habitat for upland game, birds, and migratory waterfowl on the units in the plan." This is a broad statement based on possible gains for pheasants and ducks. It does not include the analysis of losses to other species of wildlife that are certain to occur. In addition, the Commission feels there are implications in the discussions on Clark Canyon Reservoir (pg. 47-48) and Apex Reservoir (pg. 50) that the majority of the water stored in these reservoirs will be for fish and game purposes. The wording used is "conservation purposes including fish and wildlife." Yet, on page 53, in a discussion on Reichle Reservoir, "conservation purposes" are defined as irrigation, flood control and fishery.

6. With reference to the fish excluders that were included in the plans for all diversion dams, it should be pointed out that since this device is untested, the Fish and Game Department requested it only for one place, the East Bench Canal, and here on an experimental basis.

7. The Commission is particularly concerned about water losses in irrigation canals. The figures shown for the period 1926 to 1956 indicate that almost as much water was lost during transportation as was delivered to farms. This loss, of course, adds to the depletion of streams. The Commission urges intensive studies on the more efficient use of irrigation water and reduction of canal losses.

8. The Montana Fish and Game Commission feels that the analysis of the effects of the proposed developments on fish and wildlife, made primarily by the Bureau of Sport Fisheries and Wildlife and indirectly quoted in the Bureau of Reclamation's report, is based on inadequate information. In particular, it questions the adequacy of volumes of flow recommended by the Bureau of Sport Fisheries and Wildlife. Needed information includes month by month comparisons of past flows with expected flows and even day by day comparisons where necessary. Detailed field information is needed on stream conditions when they are at flow stages comparable to what is expected from the projects. Also, water temperature data for the various streams is inadequate for predicting the changes in temperature to be brought about by the proposed developments. A list of needed investigations on game as well as fish has been prepared and is attached. It is impossible to properly evaluate the effects of the proposed projects on fish and wildlife unless such information is available. Therefore, the Commission opposes approval of these water development projects by the Secretary of the Interior and opposes allocation of funds by Congress for their construction until essential studies of the effects on fish and wildlife are completed. Since these are Federal projects, the Federal Government should bear the responsibility for determining their impact on fish and game. Of the millions of dollars allocated for planning these projects, adequate funds should be provided for pertinent fish and game studies. These studies should be expeditiously pursued by the Bureau of Sport Fisheries and Wildlife. This failing, the State should be provided funds for undertaking them

Specific comments on the individual projects are as follows:

1. Madison Sub-Basin. Fish losses have occurred in the Madison River. Summer water temperatures in the lower half now occasionally reach 78° F. Since 75° F. is considered the maximum normally tolerated by trout over an extended period of time, it is obvious that the water temperatures in this river have reached the critical point. Any further development that increases the water temperature would be disasterous. The Missouri River Basin Studies of the U. S. Fish and Wildlife Service has predicted on the basis of volumes of flow, without considering temperature, that the proposed Bureau of Reclamation project would cause substantial losses in fish production in the approximately 19-mile stretch of the Madison River between Madison Diversion Dam and Ennis Lake. In addition,

the fishing in a 6.5-mile stretch of the river below Lyon Canal would be practically lost if the water were diverted for power production. Too, the effects on fishing and esthetic values resulting from proposed changes in the water level fluctuation pattern for Hebgen Lake have not been fully evaluated.

The Montana Fish and Game Commission must therefore oppose the developments proposed for the Madison Sub-Basin. Particularly so, in view of the Senate Joint Memorial No. 4 of the Thirty-Fifth Legislative Assembly of the State of Montana (1957) in which objection was raised to Bureau of Reclamation plans which would jeopardize the recreational and sport fishery values of the Madison River and Hebgen Lake.

2. Gallatin Sub-Basin. The additional ground water pumping in the West Gallatin River below Gallatin Gateway will apparently further depress the flows in the river below this point. The deplorable fishery condition which now exists for 14 miles would probably be extended to about 20 miles. In fact it is anticipated that the 2- to 3-mile stretch presently completely de-watered for irrigation each summer would be extended upstream to Shedd's Bridge, drying up an additional 5 to 6 miles of the river. Ground water pumping would probably also depress the flows in the numerous smaller spring-fed trout streams in the Gallatin Valley.

   Construction of the Spanish Creek Reservoir mentioned as an alternate proposal in the report would result in the inundation of 7.3 miles of Gallatin River and 3.1 miles of Spanish Creek. In addition to the fisheries loss in the reservoir area, there would be a substantial loss to the fishery in the 12 miles of the river between Spanish Creek Dam and Beck Border Ditch. This loss would result from a reduction in the winter flows below the minimum necessary for existing fish life. Inundation of the Spanish Creek Reservoir site would also result in the loss of an important big game winter range. This loss would be far reaching, as winter range is extremely limited in this area. Hunting, one of the major recreational values, would be affected throughout the drainage. The adverse effects of the reservoir on the Spanish Creek elk herd alone, which is becoming increasingly more important to hunters of the nation would be serious. Possible secondary effects such as haystack depredations due to the superimposing of the displaced big game populations on other herds should be considered.

In view of the above, the Montana Fish and Game Commission opposes construction of the Spanish Creek Reservoir. It reserves judgment on the ground water pumping plans until further studies are made to determine the effects on fish and wildlife.

3. Jefferson Sub-Basin. The Montana Fish and Game Commission has concurred with the report by the Missouri River Basin Studies of the Bureau of Sport Fisheries and Wildlife entitled: "A Detailed Report on Fish and Wildlife Resources in Relation to the Water Development Plan for the East Bench Unit, Three Forks Division, Montana" dated June 1956, and the revision dated June 12, 1957. Nevertheless, it is concerned about the provisions for minimum volumes of flow in the 19-mile reach of the Beaverhead River between Clark Canyon Dam and Barratts Diversion Dam. Normally the minimum during any one year would be 200 c.f.s.; whereas the minimum recommended by the Bureau of Sport Fisheries and Wildlife was 250 c.f.s. During "extended periods of extreme drought" winter flows would be reduced to 25 c.f.s. The Commission feels that 25 c.f.s. is a totally inadequate flow for this, the finest section of the Beaverhead River. In addition, clarification should be obtained on the criteria for determining what is "an extended period of extreme drought." The months during which the extreme low flows will be in affect should be specified.

The Commission reserves final judgment on the proposed Reichle Reservoir on the Big Hole River until additional studies are made by the Bureau of Sport Fisheries and Wildlife, particularly on the adequacy of the flows envisioned by the project. Within the 11 miles of stream inundated by the reservoir there will be a substantial fishery loss. It appears, however, that agreements can be reached on the flows to be delivered below this dam to insure there will be no loss and possibly benefits to the fishery downstream.

Summary:

The Montana Fish and Game Commission feels that in many important aspects the Bureau of Reclamation's water resource development plans for the Three Forks Division fail to give adequate consideration to fish and wildlife. Due to the fish and wildlife losses involved, it opposes the present plans for the Madison Sub-Basin and the alternate plan for the Spanish Creek Reservoir in the Gallatin Sub-Basin. It reserves judgment on the ground water pumping plans in the Gallatin Sub-Basin until further studies are made to determine the affects on fish and wildlife. It also reserves final judgment on the Jefferson Sub-Basin until studies evaluating the effects on fish and wildlife are concluded.

The Commission opposes approval of these water development projects by the Secretary of the Interior and opposes allocation of funds by Congress for their construction until essential studies of the effects on fish and wildlife are completed. These studies should be expeditiously pursued by the Bureau of Sport Fisheries and Wildlife. This failing, the State should be provided funds for undertaking them.

MONTANA FISH AND GAME COMMISSION

Helena, Montana

Fish and Wildlife Studies Needed for Evaluating U. S. Bureau of Reclamation Water Development Plans for the Three Forks Division

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1. Volume of flow study on the major streams affected. Month by month comparisons should be made of past flows with expected flows and even day by day comparisons should be made where necessary. Detailed field information is needed on stream conditions when they are at flow stages comparable to what is expected from the projects.

2. Study of ground water pumping plans for Gallatin Sub-Basin. This should include its effects on stream flows and in turn its effects on fish and wildlife.

Seaton

3. Water temperature investigation on each major stream including study of past records, study of year-around temperatures under present conditions, and detailed study aimed at predicting water temperatures with the water development projects in effect.

4. Biological study including fish species present, their distribution and growth rate.

5. Hebgen Lake study. Detailed analysis of the proposed changes in the water level fluctuation pattern should be made so the changes in fish populations, fishing conditions and esthetic values can be predicted.

6. Study to determine the effects of seasonal flow fluctuations on stream fish populations.

[illegible]

7. Study to determine the effects of various levels of stream-borne silt on stream fish populations.

8. Fish exluder study. Since little is known about the low submerged weir suggested as a fish excluder, it would be desirable if the effectiveness of this principle could be tested prior to its installation in East Bench Canal. In any event, the fish excluder in East Bench Canal should be evaluated after installation.

9. Utilization of the fishery. Between 1949 and 1952 studies were made by the Missouri River Basin Studies of the Bureau

of Sport Fisheries and Wildlife on fishermen utilization and success on the Madison and Gallatin Rivers. Studies are needed to up-date this information and ascertain the utilization on other important waters in the area.

10. Following construction of the water development projects, follow-up studies should be undertaken to evaluate the predictions concerning the fisheries made prior to construction. Post-impoundment fishery studies should be made on the impoundments as a guide to their management.

11. Waterfowl nesting and year-around population study. This should be carried out primarily in the Jefferson Unit. Both pre-and post-impoundment data should be collected. Pre-impoundment segments should be designed to furnish necessary information for planning and incorporating waterfowl development and hunter success projects in the over-all unit plan. Post-impoundment studies should be planned to provide data which would assist further development and provide an evaluation of the over-all affect of the project on waterfowl.

12. Spanish Creek elk study. This should be designed to investigate possible effects of the Spanish Creek impoundment on the Spanish Creek elk herd. Information on movements, reproduction, and food habits should be collected. Future hunting potential with and without the impoundment should be evaluated.

13. Lower Gallatin Canyon deer study. Data on movements, range trends, and production should be collected. Changes in hunting area populations, game depredation, and hunter access should be investigated.

14. Upland game bird evaluations. The developments proposed would result in land use changes. The effects of such changes on upland game birds have not been adequately determined and there is little substantiation for the benefits to upland game birds which are assumed to accrue.

15. Furbearer evaluation. There is need for more detailed information on population changes and other factors affecting furbearers as resulting from proposed water development projects. Some species may suffer to the point of becoming preservation problems while others may represent nuisance problems.